

**TB 11-7010-326-10-1**

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**TECHNICAL MANUAL**

**FOR**

**FORCE XXI BATTLE COMMAND BRIGADE-AND-BELOW  
(FBCB2) (VERSION 3.5)**

**NSN NA (EIC NA)  
DIGITAL OPERATORS GUIDE**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**18 MARCH 2002**







## WARNING SUMMARY

### **WARNING**

The Situational Awareness (SA) data represented on the display is provided for assistance, and may not be in real-time, or completely represent all elements on the field. Displayed icons provide a general idea and location of objects (friendly and enemy). Over-dependence on the accuracy of the SA may cause miscalculations resulting in injury. This should be noted when performing missions. Failure to comply may result in injury to personnel.







**CHANGE  
NO. 0**

**HEADQUARTERS, DEPARTMENT OF THE ARMY  
WASHINGTON, DC, 18 MARCH 2002**

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TB 11-7010-326-10-1, 18 March 2002, is updated as follows:

1. Original



**LIST OF EFFECTIVE PAGES/WORK PACKAGES**

**NOTE:** The portion of text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages / work packages are:

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**TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 125 AND TOTAL  
NUMBER OF WORK PACKAGES IS 16CONSISTING OF THE FOLLOWING:**

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NSN NA

(EIC NA)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO, Fort Monmouth, New Jersey 07703-5000. The fax number is 732-532-1413, DSN 992-1413. You may also e-mail your recommendations to AMSEL-LC-LEO-PUBS-CHG@ce-com3.monmouth.army.mil. In either case a reply will be furnished direct to you.

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**18 MARCH 2002**







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## HOW TO USE THIS MANUAL

This Digital Operator's Guide has been revised to reflect changes in Force XXI Battle Command Brigade and Below (FBCB2) software version 3.5. This guide is a tool to enhance learning and using FBCB2 capabilities. It is intended to provide users with techniques and procedures for operating FBCB2. This is only a guide. Mission, Enemy, Troops, Time-Terrain, Civilians (METT-TC) drives the use of FBCB2 on the battlefield. The Digital Operator's Guide is not intended to teach soldiers how to operate FBCB2 but rather how the system, when used correctly, is a command and control combat multiplier.

### DOCUMENT OVERVIEW

The Digital Operator's Guide is organized into chapters that describe how to utilize FBCB2 capabilities. Digital operations require standardization. Each chapter provides possible Standard Operating Procedure (SOP) considerations to achieve commonality. Unit requirements will vary. Users should determine what procedures are effective and integrate them into unit SOPs and unit training. The Digital Operator's Guide is organized as follows:

1. Section 1, The Scope, identifies the purpose and overview of this document.
2. Section 2, Battlefield Digitization, briefly describes the Army Battle Command System (ABCS).
3. Section 3, Lower Tactical Internet, describes FBCB2 communications network.
4. Section 4, FBCB2 Functionality, describes the SA display area, screen layout, and functions.
5. Section 5, Messaging, describes Combat Messages, Addressing, and Message Management.
6. Section 6, Situational Awareness, explains, SA theory, and establishment of a meaningful SA picture of the battlefield.
7. Section 7, Digital Battle Command, explains Situation Awareness, Command and Control, and techniques for employment of FBCB2 for various tasks.
8. Section 8, Mission Data Loader, describes basic procedures for employing the Mission Data Loader at Brigade, Battalion, Company, and Platoon levels.
9. Section 9, System Security, provides an outline of security considerations.
10. Section 10, Military Operations on Urban Terrain, describes considerations for employing FBCB2 in Urban Terrain.
11. Section 11, Maintenance and System Support, provides maintenance tips and Troubleshooting Procedures for the FBCB2 operator.
12. Appendix A, depicts Message Default Addressees and Access Levels.
13. Appendix B, depicts Combat Fire Mission threaded messages.
14. Appendix C FBCB2-CSSCS Message Interface.
15. Appendix D Acronyms and Abbreviations.







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**OPERATOR MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
**NSN NA, EIC NA**  
**GENERAL INFORMATION**

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**SCOPE**

This Digital Operator's Guide has been revised to reflect changes in Force XXI Battle Command Brigade and Below (FBCB2) software version 3.5. This guide is a tool to enhance learning and using FBCB2 capabilities. It is intended to provide users with techniques and procedures for operating FBCB2. This is only a guide. Mission, Enemy, Troops, Time-Terrain, Civilians (METT-TC) drives the use of FBCB2 on the battlefield. The Digital Operator's Guide is not intended to teach soldiers how to operate FBCB2 but rather how the system, when used correctly, is a command and control combat multiplier.

The FBCB2 System does not constitute new tactical doctrine. It enhances the ability of Commanders to apply the Principles of War. User skills with FBCB2 must be honed. Every opportunity must be seized to improve and expand the employment of FBCB2. Exploit the capabilities of the system, be imaginative, experiment. The accuracy and speed of Situational Awareness and Command and Control presents the prospect of a tempo of operations an enemy could never overcome.

FBCB2 visually displays Situation Awareness (SA) information, processes and displays information provided by weapon systems, sensors, and support platforms. Operators prepare and distribute orders and graphics, and receive, develop, and distribute information and data based on a common battlefield picture. FBCB2 also provides the Army the architecture for the Tactical Internet (TI) that is the communication infrastructure that provides the Command and Control (C2) between the platforms and provides the medium to exchange digital information.

**MAINTENANCE FORMS, RECORDS, AND REPORTS**

Department of the Army (DA) forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update.

Fill out and forward SF 364 (Report Of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55.

Fill out and forward Transportation Discrepancy Report (TDR) (SF 361).

**REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)**

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Product Quality Deficiency Report). Mail to: Commander, US Army Communications-Electronics Command, ATTN: AMSEL-LC-LM-LEO-E-ED-P, Fort Monmouth, NJ 07703-5000. We will send you a reply.

**END OF WORK PACKAGE**







**CHAPTER 1**  
**OPERATOR MAINTENANCE**  
**INTRODUCTORY INFORMATION WITH THEORY OF OPERATION**  
**FOR**  
**FORCE XXI BATTLE COMMAND BRIGADE-AND-BELOW**  
**(FBCB2) (VERSION 3.5)**  
**DIGITAL OPERATORS GUIDE**







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**CHAPTER 1**  
**OPERATOR MAINTENANCE**  
**INTRODUCTORY INFORMATION WITH THEORY OF OPERATION**

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**OPERATOR MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
**NSN NA, EIC NA**

**BATTLEFIELD DIGITIZATION DESCRIPTION AND DATA**

**EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES**

**BATTLEFIELD DIGITIZATION**

**ARMY BATTLE COMMAND SYSTEM (ABCS)**

The ABCS uses information technology to provide information system capabilities to the war fighter. ABCS is a composite of Battlefield Automation Systems (BAS) that provide the commander an integrated and shared common picture of the battlefield. ABCS integrates information from the BAS, as well as other existing systems, to provide quality information to the commander and allow connectivity with the sister services, the National Command Authority (NCA), and allied forces.

ABCS is a System of Systems (SoS) because of its reliance on each of its component systems to provide their particular contributions to the common picture. For example the full synergistic power of ABCS is realized when the knowledge of current weather effects and complete unit logistics status are combined with the red force information and blue force information are placed on a map background to create a common picture for the commander. The common picture described above is the product of ABCS' component systems. Without the input of any of its various components, ABCS performs to a lesser standard. Data storage, exchanges and updates occur in real-time throughout the system. ABCS facilitates data sharing across Joint and multi-national organizational boundaries. Resident and transient users have access to common data.

**ABCS Components.** The Battlefield Automation Systems (BAS) are the automated C2 processing systems that support the Battlefield Functional Areas (Air Defense, Combat Service Support, Fire Support, Intelligence and Electronic Warfare, and Maneuver). Table 1, The ABCS Battlefield Automated Systems, depicts the BAS and shows their relationship to the BFAs. ABCS Common Services, a fully integrated set of common software applications, are shown as a part of the BAS that have application across the BFAs.

**Table 1. BFA and BAS Relationship**

<b>Battlefield Functional Areas (BFAs)</b>	<b>Battlefield Automation Systems (BAS)</b>
Air Defense	AMDPCS
Combat Service Support	CSSCS
Fire Support	AFATDS
Intelligence and Electronic Warfare	ASAS/IMETS
Maneuver	DTSS/FBCB2/GCCS-AMCSTAIS

ABCS is completely reliant on communications systems to transport common picture information across the battlespace. These systems and their various sub-systems are not component systems of the ABCS, but they directly support the ABCS by providing the means to transport C2 information from one node to another. ABCS data is transported on a variety of systems such as the Area Common User System (ACUS), satellite communications systems, combat net radio (CNR) communications systems, and commercial networks.

**ABCS Operational Elements.** ABCS' Operational Elements are the Battlefield Functional Areas (BFAs) Each BFA is supported by one or more BAS. The C2 information developed by the BAS is transported through communications systems to create the common picture.

**Air Defense.** The Air and Missile Defense Planning and Control System (AMDPCS) is the BAS supporting AD functions. AMDPCS integrates AD fire units, sensors and C2 centers into a coherent system capable of defeating/denying the aerial threat (Unmanned Aerial Vehicles (UAV), helicopters, fixed wing, etc.). AMDPCS provides automated, seamless C2, and vertical and horizontal interoperability with Joint and allied forces for U.S. Army Air and Missile Defense (AMD) units. The system provides common hardware and software modules, at all echelons of command, which provides for highly effective employment of Army AMD weapon systems as part of the Joint and Alliance force. AMDPCS provides the third dimension situational awareness



**BATTLEFIELD DIGITIZATION—Continued**

(SA) component of the common picture. Initially, the Air and Missile Defense Workstation (AMDWS) provides elements from EAC to battalion, including the capability to track air and missile defense operations and provide early warning.

**Combat Service Support.** The Combat Service Support Control System (CSSCS) is the BAS supporting Combat Service Support. CSSCS provides quality automated CSS information to include all classes of supply, field services, maintenance, medical, personnel, and movements to CSS and maneuver and/or Army Service Component Commanders (ASCC) as well as their logistic and special staffs. Critical resource data is drawn from both non-automated sources and the Standard Army Management Information Systems (STAMIS) at each echelon. In the future, the STAMIS will evolve to the Global Combat Service Support – Army (GCSS-A) to provide the unclassified logistics wholesale/retail business end connectivity. CSSCS processes, analyzes and integrates resource information to support the evaluation of current and projected force sustainment capabilities. CSSCS also supports Unit Ministry, Legal, and Medical activities.

**Fire Support.** The Advanced Field Artillery Tactical Data System (AFATDS) is the BAS supporting Fire Support. AFATDS provides automated decision support to include Joint and Allied fires (i.e., naval gunfire, close air support). AFATDS provides a fully integrated FS C2 System, giving the FS Coordinator (FSCOORD) automated support for the planning, coordination, control, and execution of close support, counter-fire, interdiction, and suppression of enemy air defenses (SEAD) fires. AFATDS performs all of the FS operational functions, to include automated allocation and distribution of fires based on target value analysis. AFATDS provides the FS overlay information to the ABCS common picture. AFATDS interoperates with the USAF Theater Battle Management Core System (TBMCS) and the USN/USMC Global Command and Control System – Maritime (GCCS-M) and GCCS. AFATDS also interoperates with the FS C2 Systems of certain allied countries including United Kingdom, Germany, and France.

**Intelligence and Electronic Warfare.** The Intelligence and Electronic Warfare (IEW) BFA encompasses the collection and analysis of information to predict enemy actions, provide data on the weather, perform Intelligence Preparation of the Battlefield (IPB) and execute EW. Activities in this functional area are a continuous process and are fundamental to effective planning, security, and military deception. The All Source Analysis System (ASAS) and the Integrated Meteorological System (IMETS) are the BAS that support IEW.

ASAS is a mobile, tactically deployable, computer-assisted IEW processing, analysis, reporting and technical control system. ASAS receives and rapidly processes large volumes of information and sensor reports from all sources to provide timely and accurate targeting information, intelligence products and threat alerts. It consists of evolutionary modules that perform system operations management; system security; collection management; intelligence processing and reporting; high value/high payoff target processing and nominations, and communications processing and interfacing. The ASAS Remote Workstation (RWS) provides automated support to the doctrinal functions of Intelligence Staff Officers (G2/S2) from EAC through battalion, including Special Operations Forces. It also operates as the technical control portion of the intelligence node of ABCS to provide current IEW and enemy situation (ENSIT) information to ABCS users. ASAS produces the ENSIT portion of the ABCS common picture. ASAS will be fielded from EAC to the firing platoons.

IMETS is designed to display and analyze weather products. It provides general weather forecasting, severe weather warnings, and weather effects analysis for the commander and staff to support mission planning and execution. IMETS will be fielded from EAC to the brigade-level.

**Maneuver.** The Maneuver BFA includes C2, Mobility/ Countermobility/ Survivability as well as Maneuver. C2 has two components - the commander and the C2 system. The system supports the commander's ability to make informed decisions, delegate authority, and synchronize actions. Mobility operations preserve the freedom of maneuver of friendly forces. Countermobility denies mobility to enemy forces so Army forces can destroy them with fires and maneuver. Survivability operations protect friendly forces from the effects of enemy weapon systems and from natural occurrences. Maneuver functions include all activities that allow forces and systems to achieve a position of advantage with respect to enemy forces in order to destroy them. The Digital Topographic Support System (DTSS), the Force XXI Battle Command - Brigade and Below (FBCB2), the Global Command and Control System-Army (GCCS-A), the Maneuver Control System (MCS) and the Tactical Airspace Integration System (TAIS) are the BAS that support Maneuver functions.

DTSS is an automated system that provides tactical and operational commanders with geospatial information to support terrain visualization. DTSS is the terrain analysis tool that provides digital terrain data (map background) to ABCS for operations supporting EAC to Brigade and platform level. DTSS collects source data, manages digital terrain databases and distributes data to an ABCS BAS map server or repository. The database is accessible through the local area network (LAN) or via a removable media. The DTSS Geographic Information System (GIS) and imagery analysis software components allow the analyst to manipulate, analyze and produce limited low volume hard copy mission specific products for the commander. National and



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**BATTLEFIELD DIGITIZATION—Continued**

in-theater sources provide new and enriched data to update the geospatial database. DTSS will be fielded from EAC to the brigade-level.

FBCB2 is a digital battle command information system that provides integrated, on-the-move, timely, battle command information to tactical combat, combat support and combat service support leaders and soldiers. FBCB2 completes the ABCS information flow process from brigade to platform and across all platforms within the brigade and task force. FBCB2 supports situational awareness down to the soldier/ platform level and across the BFAs at Brigade and below. Additionally, FBCB2 enables commanders to operate remotely and maintain connectivity to ABCS common picture information regardless of command vehicle/location, and to digitally control and monitor their subordinate units' status and position. FBCB2 provides ABCS with automated positional friendly information and current tactical battlefield geometry for friendly and known/suspected enemy forces. FBCB2 will be fielded to mounted and dismounted maneuver forces (legacy, interim and objective) armor/cavalry/reconnaissance, and armored cavalry, mechanized infantry, infantry and aviation units and their associated CS/CSS units normally provided from division or corps.

GCCS-A supports C2 at the strategic operational/theater level of command. GCCS-A provides an integrated and automated C2 system for Army strategic and theater commanders; to corps and to divisions when they perform task force or Army Service Component Commander (ASCC) responsibilities in support of Joint operations. GCCS-A supports the apportionment, allocation, logistical support, mobilization, deployment and re-deployment of Army forces to the combatant commands. GCCS-A provides C2 capabilities that support the commander's need for a fused, real-time true picture of his battlespace. In addition, GCCS-A enhances the commander's ability to command control, and coordinate vertically and horizontally the information necessary to accomplish his mission. GCCS-A is ABCS' link to the GCCS and is the Army's extension of the Joint GCCS. GCCS-A will be fielded from EAC to corps.

MCS is the primary battle command source, providing the common picture, decision aids and overlay capabilities to support the tactical commander and the staff via interface with the force level information data provided by the other BFAs. MCS provides the functional applications necessary to access and manipulate ABCS' common data. MCS satisfies information requirements for a specific operation, tracks resources, displays situational awareness, effects timely control of current combat operations (offense, defense, stability and support), and effectively develops and distributes plans, orders and estimates in support of future operations. It supports the military decision making process. MCS is the primary input source for maneuver unit (armor, aviation and infantry) data elements as well as data elements from the functional areas of signal, engineer, military police and nuclear, biological and chemical (NBC) operations. MCS will be fielded from corps to the maneuver battalions.

Tactical Airspace Integration System (TAIS) provides automated Army Airspace Command and Control (A2C2) planning, and enhanced A2C2 execution, improved theater and intra- and inter-Corps/Division Air Traffic Service (ATS) support in peace, crisis, or conflict. It is effective for total battlefield synchronization in the third and fourth dimension (altitude and time respectively) and has an added civil and government inter-agency capability. TAIS provides a direct link to the Theater Air Ground System (TAGS) through interface with the Joint Forces Air Component Commander's (JFACC) automated airspace planning and communication systems. TAIS will be fielded from EC to division.

**FBCB2 SYSTEMS DESCRIPTION**

FBCB2 is a battle command information system designed for units performing missions at the tactical level. FBCB2 integrates with each of the Battlefield Operating Systems (BOS) providing seamless battle command capability with increased battlefield operational capabilities. FBCB2 provides command control capabilities relevant to each of the battlefield functional areas, increasing the effectiveness of their operational capabilities.

FBCB2 displays the relevant Situational Awareness (SA) picture of the battlefield. SA shows the user his location, the location of other friendly forces, observed enemy locations and all known battlefield obstacles. The war-fighter receives data "pushed" from all the battlefield systems to maintain near real-time battle information.

FBCB2 receives data across the Tactical Internet via the Internet Controller (INC) or router. The INC is a tactical router built into the SINCGARS radio mount. The Enhanced Position Location Reporting System (EPLRS) data radio and Single Channel Ground Air Radio System (SINCGARS) data/voice radio transmit/receive digital information between vehicles. Each FBCB2 derives its own location via the Precision Lightweight GPS Receiver (PLGR). Utilizing these interfaces, the FBCB2 automatically updates and broadcasts its current location to all other FBCB2 and Embedded Battle Command (EBC) platforms. Embedded Battle Command (EBC) is a separate software package that enables FBCB2 platforms to share SA and C2 with battalion and brigade TOCs.



**BATTLEFIELD DIGITIZATION—Continued**

Digital systems on the battlefield pass messages using the Joint Variable Message Format (JVMF). JVMF is a Department of Defense standardized message format. It prescribes uniform message formats for all branches of the armed services.

**EMBEDDED BATTLE COMMAND (EBC)**

EBC provides TI connectivity and communications services. It configures, controls and employs the INC to send and receive digital information across EPLRS Very High Speed Integrated Circuit (VHSIC) and SINCGARS Advanced System Improvement Program (ASIP) radios. EBC is found in battalion and brigade TOCs. It is a separate software package that allows platforms to share SA and C2 with FBCB2-equipped platforms. EBC capabilities are:

1. SA Processing
2. TI Network Connectivity and Management.
3. JVMF message processing C2.
4. Data Management Security.

**END OF WORK PACKAGE**



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**MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
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**LOWER TACTICAL INTERNET THEORY OF OPERATION**

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**Lower Tactical Internet**

**CONNECTIVITY**

The Tactical Internet (TI) is the highway for data communications at Corps and below echelons. This network also links to strategic networks connecting Corps levels with theater communications and worldwide Department of Defense communications. The TI is comprised of 2 echelons, the Upper TI and the Lower TI. The Upper TI passes SA and C2 between command posts at task force level and higher. Brigade and below operate on the Lower TI. The FBCB2 System operates on the Lower TI but also sends information to the Upper TI. This section concentrates on the lower TI network (Brigade and Below).

The Internet terminology arises because the Tactical Internet duplicates many of the essential features of the Commercial Internet. First, it is as "seamless" as possible: that is, messages travel from sender to recipient with minimal user manipulation of the communication network. Second, Internet protocols (methods the radios and routers use to switch signals through out the net) are used in a manner similar to those of the worldwide web. In fact, commercial approaches to message routing are used as much as possible.

The FBCB2 System allows each platform user in the network to send and receive digital data information across the battlefield using the Tactical Internet.

**FBCB2 SYSTEM COMPONENTS**

**SINGARS-ASIP.** The SINGARS radio has two capabilities; it transmits both voice and digital data. Unit SOP will give you the guidance on when you use the data transmission and when you use voice only. For the purpose of the TI and therefore FBCB2, the ASIP radio is used for data transmission in the "PKT" mode of operation.

**EPLRS.** The EPLRS radio is a "data-only" radio. It is the "backbone" of the lower TI; it allows the data transmissions to be passed from one level of the TI to the next higher level. Not all platforms receive an EPLRS radio, so those platforms that do have EPLRS are potential relays for both SA and C2 data.

**Internet Controller (INC).** The INC is a tactical router that provides the interface between the EPLRS, SINGARS, and FBCB2. The INC is the traffic controller at the radio interface. The INCs traffic controller role is dependent on the database that the FBCB2 downloads into the INC software upon startup initialization with the FBCB2. The INC routes the data signal automatically to specific IP addresses downloaded by the FBCB2, making the data flow through the Lower TI as seamless as possible.

**Precision Lightweight Global Positioning System (PLGR).** The GPS/PLGR provides each FBCB2 System with time, heading or position information, which is used by the system to send platform locations (SA) through the lower TI.

**How FBCB2 Fits Into The Digitized Battlefield.** The FBCB2 System integrates with the TI to receive and send data to other designated systems. Both Situational Awareness (SA) data and Command and Control (C2) data are sent.

**SA.** The SA data consists of the user location, the location of other friendly forces and unknown forces. SA data is sent through a relay called a "Position Server" to the next level in the TI. This data is displayed on the FBCB2 display unit in the form of position locations and geo-reference information.

**C2.** The C2 data consists of message formats for reports, orders and overlays that the user needs to disseminate based on the tactical situation. C2 data is sent through an EPLRS that acts as a "Gateway" to the next higher level. In either case, the FBCB2 system uses the TI to direct data to specific users designated to receive the data.

**METHODS OF TI DATA EXCHANGE**

The Lower TI provides the ability to directly interconnect SA and C2 data among FBCB2s within a Brigade (BDE). The "Unicast" and "Multicast" methods of data exchange are the two methods of exchanging data from one FBCB2 System to another.

**Unicast.** The Unicast method of data exchange sometimes called "Point to Point or One-to-One", allows two FBCB2 Systems to send data to each other with even higher reliability because the receiving radio determines if any data is lost and ensures that it is re-sent correctly. This specific "One to One" link is established by the EPLRS Net Control Station or EPLRS Network



Manager [ENM] software and is transparent to the user. An example of the unicast method is talking on the telephone where a switch may be used to maintain the connection. Unicast does not mean that the radios must be directly linked from one radio to another, but must have the ability to talk to each other through some mutual communication link such as the "gateways or servers". An example, two FBCB2 Systems (Wingman) are the source systems. They talk to each other point to point through the server EPLRS radio when the systems cannot talk directly to each other because of line of sight, distance or other limitation.

**Multicast.** The Multicast method of data exchange sometimes called "Many-to-Many" allows many source FBCB2 Systems to reliably send data to other source FBCB2 Systems and to an unlimited number of designated FBCB2 Systems. Multicast links are established by the EPLRS NCS or EPLRS Network Manager [ENM] software and data is sent to a specific group of platforms. An example of Multicast method is a group of people talking on a conference call each speaking when they have something to say and when no one else is speaking.

Any of the FBCB2 Systems in this multicast net group can send its message to all the other systems in the net, but if a platform is not part of the group database, it will not receive the message.

Just as with the Unicast method of data exchange, a mutual communication link such as a "gateway or server" is used to link the source FBCB2 Systems together.

**SINGARS Stubnet.** The Lower Tactical Internet uses a combination of radios, routers, and LANs to send data using the unicast or multicast method of data exchange.

The SINGARS "stub net" connects as low as possible in the organization to the EPLRS Server. The EPLRS equipped Platoon Leaders or Platoon Sergeants act as the server or gateway to the company or battalion. If the Platoon Leader's EPLRS system becomes inoperable the Platoon Sergeant's EPLRS radio continues the flow of data to the next level.

For non- EPLRS equipped platforms at platoon level (i.e., Wingman), the SINGARS radio and Internet Controller router are the means to transfer SA or C2 data through the lower TI. The INC database is initialized by the platform's FBCB2 System that downloads predetermined IP addresses; this ensures that data flows to a gateway or server with the same database IP addresses. SA and C2 data flows from the INCs at the lower platoon level to the EPLRS equipped Platoon Leaders or Platoon Sergeants to the next higher level.

**Needline Functions.** The EPLRS radio forms communication links with other EPLRS radios based on "the need to communicate". This link is called a "Needline" or "Logical Channel Number". An example, the EPLRS equipped Platoon Server or Gateway needs to talk to the EPLRS equipped Battalion Server or Gateway over this "Needline" to send data to other FBCB2 Systems within the battalion.

Each particular "Needline or Logical Channel Number" uses a unicast or multicast method of data exchange. There can be many needlines running through a radio set at one time, supporting the FBCB2s data communication needs. C2 and SA data links are established on different needlines within a single EPLRS radio. Therefore, it is possible to have degraded "Comms" receiving C2 data but have unaffected SA data flow or vice versa from the same EPLRS radio. The "Status" function is a tool to help determine when this occurs.

**Carrier Sensed Multiple Access (CSMA).** To disseminate C2 or SA data to the many FBCB2 Systems across the Battalion and the Brigade, the EPLRS radio uses a multicast method of data exchange called Carrier Sensed Multiple Access "CSMA". This means the EPLRS radio manages the many FBCB2 systems using an established multicast C2 or SA needline. In the example of a group of people talking on a conference call each speaking when they have something to say, and no one else is speaking, a mediator will control the time when each person can speak if the net is busy. The EPLRS radio gives each FBCB2 System on the multicast net a transmit time slot if the net is busy.

At platoon or company level, the CSMA Net Server sends its data to the Battalions CSMA Net Server over the established C2 or SA CSMA needlines. This process continues on to the Brigade level using the same process. The Battalions within the Brigades are linked to the lower TI and therefore can receive data from other Battalions within the Brigade as long as they have the same designated IP addresses.

## RANGE EXTENSION SOLUTIONS

As the FBCB2 System matures, greater capability will result from connection to other complex systems. Range Extension provides for extending the TI communication range of Reconnaissance Units. When Recon Units and other platforms go beyond the range of the line-of sight (LOS) EPLRS communications, the INC version 5.0 automatically detects the out-of range condition and provides the communications connectivity between the FBCB2 System and the AN/PSC-5 (Spitfire) radio which uses military satellite communications (MILSATCOM).

The interface supports servers used to disseminate SA between the extended platforms and the TOCs that are connected to the EPLRS backbone. Once an FBCB2 is elected as a server in support of range extension, SA is forwarded to the PSC-5 and onto



the MILSATCOM based on software dissemination rules. One multicast group is defined and used for the SA range extension dissemination.

The BDE TOC INC is the C2 message gateway and the Reconnaissance (Recon) Troop Commander is the elected C2 message gateway for all the recon platforms. The exact application interface is the JVMF message set.

**END OF WORK PACKAGE**







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**FBCB2 FUNCTIONALITY**

**SESSION MANAGER SCREEN AREA AND FUNCTIONS**

The "Session Manager" screen is the first screen seen after the boot up sequence completes. It allows access to:

1. Functions for system administration.
2. Access to the Display Process screen.
3. Other applications.
4. The "Session Manager" screen divides into four main areas:
  - a. Security Classification Bar.
  - b. The Background Picture Area.
  - c. Task Bar.
  - d. Function Bar.

**Security Classification Bar.** Located at the top of the screen, the Security Classification Bar readily tells the user the classification of the system. This bar remains active on every screen. It displays the current operational security classification in accordance with Department of Defense (DOD) standard color definitions. The current software allows the system to operate in an unclassified or secret mode. The user can change the classification of the system based on the user access level. The following colors indicate the system classification level:

1. Red - Secret.
2. Green - Unclassified.

**Background Picture Area.** The Background Picture Area is like "wallpaper" on a regular desktop computer.

**Task Bar.** The Task Bar is located at the bottom of the screen and is visible at all times. The Task Bar includes the following:

1. Start Menu.
2. Session Windows.
3. System tray.

**Function Bar.** At the bottom, right corner of the screen is the Function Bar. The Function Bar consists of function buttons and text boxes. The function buttons allow the user to activate the Ops or Playback applications. The Function Bar contains the following options:

1. System Classification Text Box - Displays the system classification.
2. Online/Offline Toggle Button - When the system is Offline, the Session Manager Screen Function Bar displays the "International Don't" symbol over the two terminal menu options. The system cannot receive or process data from the Tactical Internet (TI) while Offline. Received SA Data and C2 Data are stored in the router queue until the system is Online. When Online, the system receives and processes data from the Tactical Internet.
3. OPS Button - Accesses the operations portion of the software. The Ops area is where the majority of the FBCB2 functions occur.
4. Playback Button - The Playback function allows the user to replay previously- entered or received data that is stored in memory. The system replays all of the actions from that period just like an "instant replay". The system does not have online capability when in the playback mode. The files play back in real time. For example, a four-hour operation takes four hours to view.
5. Unit/Role Text Box - Identifies the unit and role of the FBCB2 System.

**Start Menu.** To access the start menu select the "Start" button at the lower left corner of the screen. The Start Menu offers different options depending upon the login status of the user. If not logged on, the following options are available:

1. Login - Activates system log-on function.
2. Help - Accesses Context Sensitive Help.
3. Shut Down - Shuts down the FBCB2 software.
4. Log-Off - Activates system log-off function.



**Ops Login.** The "Ops Login" dialog box displays. In the "Password:" data field:

1. Enter [fbc2].
2. Select [Continue] button.
3. The "Ops Login" dialog box closes.
4. Select [Start] button.

After logging in, the Start menu displays the following options:

1. FBC2.
2. Settings.
3. Help.
4. Log-Off.
5. Shut Down.

**The FBC2 Function.** The FBC2 function has the following actions:

1. Mission Data Load - Creates and loads a mission by combining one or more application generated products into a mission data set. The Mission Data Set writes to a portable mass storage device for transportation to targeted FBC2s.
2. Security... - Allows authorized users to generate and assign passwords.
3. SysAdmin... - Allows users to clear logs and queues and configure the role.
4. UTRAdmin... - Allows authorized users to manage Heartbeat UTO updates. (Must be online to run UTRAdmin).
5. Clears Logs and Queues... - Shortcut directly to this function.
6. Configure Role... - Shortcut directly to this function.
7. Restore Database - Takes the user back the previously uncorrupted role.
8. Tools - Accesses Host Info, Message Info, Network Info, MILSATCOM Info, UTO info and URO Emulator.
9. Exit BCOPS function is designed as a backup method for exiting the "OPS" screen if the "F Admin" Exit Ops function is not functioning

**Settings Function.** The "Settings" function allows adjustment to the following:

1. Bell Settings - Accesses system "Bell On" or "Bell Off" function.
2. Keyboard - Accesses "Auto Repeat On" or "Auto Repeat Off" keyboard function.
3. Mouse... - Sets mouse acceleration.
4. Touch Screen... - Accesses touch screen calibration functions.

**The Help Function.** The Help Function accesses:

1. On FBC2 Session - Accesses context sensitive help.
2. Tutorial - Accesses the embedded tutorial.
3. Software Users Manual - Accesses the online Software Users Manual.
4. Equipment Operators Manual - Accesses the online Equipment Operators Manual (EOM).
5. POIs - Accesses the Program of Instruction (POI) pages.
6. Software Version - Displays current software version information.

**Log Off.**

1. Log Off - Logs the system off. The system goes through a log off process and displays the "Offline" button in the Function bar.
2. Cancel - Closes the warning box.

**Shut Down Function.** The "Shut Down" function accesses:

1. Shut Down... - Performs system shut down.
2. Reboot... - Performs system reboot.

## SYSTEM ADMINISTRATION TOOLS AT OPERATOR LEVEL

It is important before beginning a new mission to reset system defaults and remove old messages and data. After clearing the system of old data, it is necessary to set the system to operate using user-defined settings.

**Clear Logs And Queues.** Operating the FBC2 on a daily basis causes the accumulation of messages in the message queues and a record of the machine's operations in the logs. This greatly reduces the system memory and causes the system to slow so much that it might take several minutes to accomplish a task. To prevent this, periodically delete unnecessary Logs and Queues.



1. Comm Logs - Deletes all play back files.
2. Message Transmission Logs - Deletes all sent queues.
3. SA Snapshot Data - Deletes all SA data stored in memory.
4. Messages - Deletes all or selected messages types stored in memory.
5. Threaded Messages Data - Deletes all or selected threaded messages types.
6. User Defined Settings - Deletes all or selected user defined settings.
7. Reset System - Deletes all saved files from system.

**Configure The Role.** The "Configure Role" function allows the user to change their role/ID and reconfigure the system to the new role/ID. Selecting Configure Role deletes all data, address groups, messages, filters, etc.

The following action is required to reconfigure the system when the Configure Role dialog box is opened:

1. Select [Division] down arrow.
2. Select [Brigade] down arrow.
3. Select [Battalion] down arrow.
4. Select [Company] down arrow.
5. Select [Platoon] down arrow.
6. Select [Matching Roles] down arrow.
7. Select [Configure] button.

The "Verification" dialog box opens and displays "Do you want to continue with configuration"

Select [Yes] button.

The "Role Configuration Progress" dialog box opens with the "Reboot" button grayed out. It shows the time remaining until complete, which takes between 2 to 5 minutes. When the "Reboot" button is available, configuration is complete.

Select [Reboot] button.

The system reboots to the selected Role.

#### **Restore Database.**

The "Restore Database" allows the user to return to the last uncorrupted role. If a failure occurs while performing a role change procedure, then the user can select the Restore Database function to re-configure the system to the previous operational role.

Select [Restore Database] option to perform function.

The following message is then displayed, "Continuing this action will delete all messages, message settings and user settings. Do you want to continue"

Select [OK] button to proceed.

The "Restoring the Database..." message is displayed when the restoration process begins, and "The database has been restored" message is displayed when it is complete.

#### **Exit BCOPS.**

The "Exit BCOPS" function is designed as a backup method for exiting the "OPS" screen if the "F6 Admin Exit Ops..." function is not functioning

1. Select the "FBCB2" option.
2. Select [Yes] button.

Host Info Contains:

**Tools.** The Tools function allows the user to retrieve and view node information, Unit Reference Number (URN), view network MILSATCOM status, UTO information and process information commands to the EPLRS radio through the URO Emulator.. These tools assist in the troubleshooting and fault isolation procedures. The Tools cascading menu consists of six options:

1. Host Info.
2. Message Info.
3. Network Info.
4. MILSATCOM Info. (Role Specific)
5. UTO Info.
6. URO Emulator



**Host (Node) Information.** The system displays the "Host Information" dialog box. Host Information contains system and communication setup information for the FBCB2. This function allows the operator to view specific information. The "Host Information" dialog box displays three selections:

1. This node (default).
2. Enter a URN.
3. Q - Quit.

If "This node" or "Enter a URN" is selected the following information is displayed.

1. URN#.
2. Platform ID#.
3. Role code.
4. Platform Type.
5. Platform Symbol.
6. Net Frequency.
7. Role Name.
8. Unit Identification Code.
9. Unit Symbol Info.
10. Internet Protocol (IP) Name.
11. Internet Protocol (IP) Address (for host, router 1, router 2, and LAN).
12. File data.

Additional Host Information displays:

1. Comm Net Assignments.
2. EPLRS ID.
3. Resource.
4. Logical Channel Number (LCN).
5. UDP port.
6. Broadcast URN.
7. Database Version.

**Network Information.** Network Information tells the user what broadcast network the system is connected to and what other units are on that network. Network Info allows the user to verify the URN.

**MILSATCOM Info.** MILSATCOM Information displays "read only" information and allows the user to view three pieces of MILSATCOM status information.:

1. MILSATCOM overall status.
2. Interface status
3. Connectivity status.

**UTO Information.** The system displays the "FBCB2 Task Organization" dialog box. The FBCB2 Task Organization information provides the user a graphical or tabular view of the UTO.

Dialog box function buttons:

1. Zoom In (Allows the user to zoom in and view a selected unit and its assigned units).
2. Zoom Out (Allows the user to zoom out, from a zoom in view).
3. Switch UTO (Not available at this level).
4. Print (Not available at this level).
5. Exit (Closes the dialog box).
6. Help (Not available at this level).

Filter check boxes:

1. Unit Desc Filter - Filters on/off the unit description text located under a unit symbol.
2. UIC Filter - Filters on/off the Unit Identification Code (UIC) located on the right of the unit symbol.

The following views are available by selecting one of the radio buttons:

1. Graphical - Allows user to view the UTO in graphical form. The user must scroll right, left, up or down to view all available units.
2. Tabular - Allows the user to view the UTO in a tabular form. In the tabular view, all options are unavailable except the Exit function button and the UIC filter.



**URO Emulator.** The "URO Emulator" is a emulator of the actual User Read Out (URO) device. This allows the user to activate URO functions through the FBCB2 System software.

## SA DISPLAY AREA

The SA display area is the automatic graphical display of SA data, maps, grids, and overlays. SA data includes friendly and enemy units, air track positions, and georeferences. The "own" platform symbol displays vehicle heading and weapon orientation when available from other non-FBCB2 on-board systems. The system portrays the currency of Friendly Units. The system automatically displays positions on the screen as generated by vehicle devices or incoming messages. To avoid cluttering the SA area with unwanted icons each echelon and unit type can filter out unwanted information, such as icons, georeferences and overlays, using the filter function.

## FBCB2 DISPLAY PROCESS SCREEN LAYOUT

**Security Classification Bar.** Located at the top of the screen, the Security Classification Bar readily tells the user the classification of the system. This bar remains active on every screen. It displays the current operational security classification in accordance with Department of Defense (DOD) standard color definitions. The current software allows the system to operate in an Unclassified or Secret mode. The user can change the classification, based on his user access level. The following colors indicate the system classification level:

1. Red - Secret
2. Green - Unclassified

### Status Bar

**Date Time Group (DTG).** Current date and time (ZULU) as set by the Global Positioning System (GPS)/PLGR or the FBCB2 System The user cannot set the date and time here.

### Status Indicators.

Status Indicators, sometimes referred to as "gumballs", are located at the top left of the "FBCB2 Display Process" screen. These gumballs give the user a heads up warning as to the status of the corresponding components. The Comms and GPS gumballs are standard in all FBCB2 platforms. Additional gumballs (i.e., LRAS, BCIS and Chembio) are displayed when other system components are attached to the FBCB2. These three gumballs directly reflect the status of the F5 "Status" Button. The gumballs identified from left to right are:

1. Comms - Status of FBCB2 communications systems, including SINCGARS, EPLRS, and MILSATCOM, if installed.
2. GPS - Status of the PLGR.
3. BCIS - Status of the BCIS System, if installed.
4. LRAS3 - Status of the LRAS3 System, if installed.
5. Chembios Status - Status of the MICAD System, if installed.

### Gumball Colors.

Gumball status is indicated by the following color code:

1. Green - Go. The system is at optimum operating level.
2. Amber - Degraded. There are one or more faults, but not enough to fail.
3. Red - No Go. One or more faults have brought the system down.
4. White - Not Tested. FBCB2 software can not detected the system. The system may not be installed or disconnected.

**FIPR Message Notification.** The Flash, Immediate, Priority, Routine (FIPR) Precedence Message Notification displays the number of messages in each queue.

**Warnings/Alerts Marquee.** When the unit receives a life threatening warning or alert message it displays the warning message title in sequence and displays the message for the time set in "Warning Time Interval" through "Admin".

**The Function Bar.** The system displays the "Ops Function Bar" down the right side of the SA area. The Ops Function Bar is briefly discussed in this section.

1. The "Grab" button selects multiple icons and view their information. A "Hook Dialog" box is displayed and lists the information for each of the icons.
2. The "Zoom" button is a quick method of viewing locations on the map at different sizes.
3. The "View" button removes the Ops Function Bar and view the icons underneath it. Double clicking on the "View" button removes the OMNI Directional Pan box.



4. The "NAV" button accesses the "Navigation Dialog" box.
5. The Quick Send associates a message to the button. Selecting the button sends the message in an expedient manner. The operator creates and saves the message, then associates it to the button.
6. The "Auto Center" button, when selected, continuously centers the users icon on the screen. This includes the area under the Ops Function Bar. The system displays an international "Don't" symbol when this feature is toggled off.
7. The "FIPR" button displays the "FIPR" dialog box. The user selects this button to view the messages queues. The "FIPR" button displays the number of messages
8. The "FIPR" button displays the "FIPR" dialog box. The user selects this button to view the message queues. The "FIPR" button displays the number of messages received by the system. An audible alarm of short duration alerts the user to incoming messages. The number on the button represents the total number of messages in the queue. The black exclamation point (!), highlighted in yellow, on the "FIPR" button indicates that one or more warning messages are in the queue. The black plus (+) mark, highlighted in yellow indicates that an operator response is required on at least one message. The "FIPR" dialog box has the following tabs:
  - a. F - Flash
  - b. I - Immediate
  - c. P - Priority
  - d. R - Routine

**The Warning Tab.** Warnings - The "Warnings" tab displays the number of Caution/Warning messages received and currently saved.

**The Top Button.** The "Top" button enables the user to quickly display the highest precedence, most recently received message in the message queue.

**The Role Name/Classification/Location and Cursor Position.** The system displays the currently loaded Platform Role, ID and system classification. Selecting this button gives the coordinates of the user's platform. The default setting is Platform Role and ID. The cursor position displays the coordinates of the cursor's position on the SA Area. The default setting is MGRS. Pressing the space bar cycles the four coordinate formats:

1. MGRS (Military Grid Reference System)
2. UTM (Universal Transverse Mercator)
3. Latitude/Longitude
4. DMS (Degree Minutes Seconds)

**The F1 Map... Button.** The "F1 Map..." button brings up the "Map Control" dialog box, which consists of three main tab groups.

1. Grid
2. Center
3. Background

**F2 Filters... Button.** The "F2 Filters" function provides the capability to tailor the information displayed on the SA area using specific filters. Removing the SA clutter using filters allows the user to see the battlefield their way and to adapt that view according to mission requirements. The Filter function consists of four tabs.

1. SA
2. Collapse/Expand
3. Overlays
4. Obstacle Overlays

**F3 Combat Msgs... Button.** The "F3 Combat Msgs" button displays the combat message dialog box. The Combat Message function allows the operator to create, send, and save messages in an expedient manner. Six message types comprise the combat message templates. They are:

1. SALT - Size, Activity, Location and Time
2. MEDEVAC - Medical Evacuation
3. NBC1 - Nuclear, Biological, and Chemical
4. Fire Mission
5. Check Fire All
6. SITREP - Situation Report



**F4 Messages... Button.** The "F4 Messages..." button brings up the "Messages" dialog box. The tab groups are:

1. Send
  2. Create
  3. Edit
  4. Print - (Function not available)
  5. Manage
  6. Sent Queue
1. System
  2. SA
  3. General

**F5 Status... Button.** The "F5 Status" button displays the "Status" dialog box that contains read-only information on the status of equipment connected to the FBCB2 System. The Status function also displays the status of connectivity with the Tactical Internet, and removable hard disk drive cartridge utilization under three tabs:

1. System
2. SA
3. General

**F6 Admin... Button.** The "F6 Admin" button displays the "Admin" dialog box, which has three main tabs and two additional functions:

1. "Platform Settings" tab
2. "Local Settings" tab
3. "SA Settings" tab
4. "Exit OPS..." button
5. "Destroy FBCB2" button

**F7 Apps... Button.** The F7 "Apps" button displays the "Apps" dialog box, which contains two tabs and the following 10 options:

1. Circular Line of Site
2. Drivers Display
3. LOG Report
4. Line of Sight
5. Navigation
6. Periodic Reminders
7. Personnel Status Report
8. Radio Net Join
9. Taylor Supply Point List
10. Task Management

**The F8 Help button.** The "F8 Help" button gives the user help on using the FBCB2 software. The "Help" dialog box displays the current version of software and patches in use.

**Map Zoom In/Out.** The Map Zoom In/Out box is a method of increasing or decreasing the magnification settings. Selecting the down arrow causes the system to display a listing of zoom settings. The user changes the map zoom setting by selecting from the displayed list. The possible zoom settings are:

1. 1/4x
2. 1/2x
3. 1x
4. 2x
5. 4x
6. 8x

The button to the right of Map Zoom In/Out displays the local time. The user can select the local time zone in the F6 Admin button.

**SA Display Area.** The FBCB2 System provides each echelon with SA of the battlefield, through filtering out selected icons. This is dictated through the Unit SOP. The SA display area allows for the automatic graphical display of SA data, maps, grids, and overlays. SA data includes friendly and enemy units, air track positions, and georeferences.



The "own" platform symbol displays vehicle heading and weapon orientation when available from other non-FBCB2, on-board systems. The system portrays the currency of friendly units. The system automatically displays positions on the screen as generated by vehicle devices or incoming messages.

**END OF WORK PACKAGE**



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### **SHORT FORM MESSAGES**

Combat or short message formats are sub-sets of long form message formats. The (F3) "COMBAT MSG" button allows the user to send only the critical data fields of the corresponding long form message. The Combat Message requires no keyboard entry. Most applications are performed via the digital display. Each combat message has default addresses. The operator can alter the addressees from the "COMBAT MSG" dialog box by selecting the long form message button at the bottom of the combat message. However, doing this affects only the current message and does not change the default addresses for subsequent messages. To permanently change the default address the operator must select the "MESSAGES" (F4) button, select the desired message, select the "SET DEFAULT MESSAGE ADDRESSING", and then change the addressees. The addressees selected become the defaults for that specific combat message.

### **LONG FORM MESSAGES**

Long form message formats can be reached by two methods. The first method is from the "MESSAGES" (F4) button. Select the desired message from the menu. The second method is accessing selected messages from the "COMBAT MSG" (F3) button. The operator may go to the long form message counterpart by selecting on the long form message button at the bottom of the combat message dialog box.

Role based functionality provides different message creation capabilities based on the users' role or echelon (all roles can receive/read incoming messages). Users can preview messages in textual format while in the process of creating or editing the long form message.

Long form messages provide more detail than the combat message. This is particularly useful when time is available and the pace of operations affords the ability to provide more complete information.

### **DEFAULT MESSAGE ADDRESSES**

It is critical that information be disseminated throughout the digitized force in a manner that optimizes speed of service and minimizes the burden on the user. FBCB2 uses a two-tiered default messaging system, utilizing machine default addressing and operator-defined addressing. Machine default is minimal and satisfies two requirements. The first requirement is to facilitate critical links to other ABCS systems for threaded messages. Second, to ensure that combat-critical messages, which spawn SA, can be sent quickly, without the possibility of the unnecessary delay associated with having to address them, as they are prepared. All machine default addressees are action addressees. The list of messages in Appendix A indicates which messages have a machine default addressee. Overlay messages and Field Order messages do not have machine default addressees. Considerations for development and distribution of these messages are discussed in Section 8.

### **MESSAGE ADDRESSING**

Operator-defined default addressing is the primary method for ensuring that information be disseminated in accordance with the commander's wishes. Each unit as a matter of Standard Operating Procedure (SOP) establishes defined defaults for each message. Once defined and entered into the FBCB2 System during pre-combat operations, operator-defined message addresses are saved in the computer. Operator-defined message addresses are either action addressees or info addressees, or both as determined by the SOP.

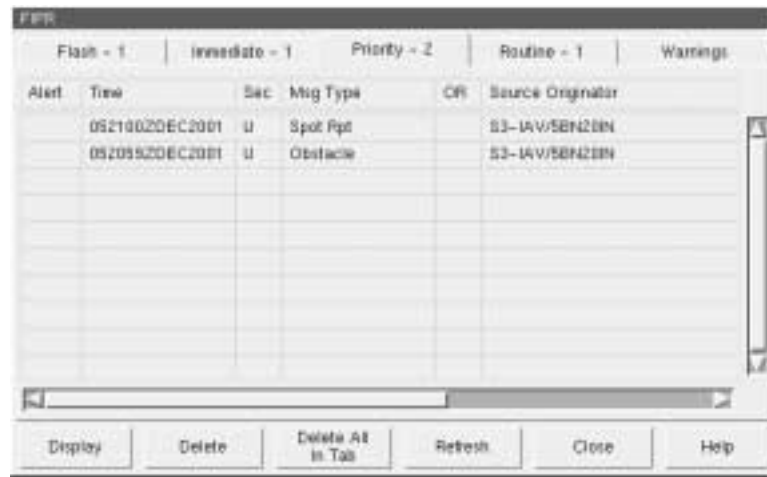
### **MESSAGE MANAGEMENT**

A unit's SOP directs message-handling procedures. Standard message management procedures reduce confusion and extra work. Message management includes:

1. Message/overlay naming conventions
2. Filing procedures
3. Message precedence
4. Message Use



**Incoming Messages.** The FIPR Message Queue is displayed on the function bar of the display process screen. Users can quickly determine if there are incoming messages and the priority of the message. For a more detailed list of messages, the operator can go to the FIPR dialog box. This box has tabs depicting the precedence and number of each message in the queue. If an Alert or Warning (STRIKEWARN, MOPP, etc) is received, it scrolls across the marquee until opened and saved/deleted.



### FIPR Message Queue

**Forwarding Messages.** FBCB2 has a forward capability for all incoming messages with the exception of overlays and free text messages (free text messages can be "replied to" or "saved as" and the transmission settings modified in order to forward the message). Operators can forward messages by opening the message from the FIPR queue and selecting "forward", "message addressing", and "send". Units may consider establishing a procedure on forwarding messages, orders, or overlays, to ensure everyone that requires the message receives it. This reduces traffic overload on the TI and prevent the same message being received numerous times by the same user. An example of how a unit may establish a message forwarding procedure follows:

1. The company commander receives TF/BDE messages.
2. The company commander forwards the file to the XO, 1SG and platoon leaders.
3. Platoon leaders forward to platoon sergeants, etc.

Recommend that one vehicle per Company size element (XO, 1SG or Company TOC) and one vehicle at each Battalion/Brigade TOC is designated the "digital library" platform. This vehicle is the source of back up digital files in case a platform did not receive overlays, orders, etc., as a result of a system crash or a vehicle power problem. This prevents commanders, first sergeants or CPs being called upon to re-send items during critical events.

**Mission Folder Management and File Naming Conventions.** An important part of incoming message management is unit consistency in storing all files in an organized manner. Folders, like directories, enable the user to store and find messages quickly. Messaging protocols do not allow the file name to be transmitted with the message. Units standardize the way the files are saved to expedite file retrieval. One way to effectively manage messages is by exercising mission titles instead of the traditional OPORD numbering system. Designate mission names and message folders prior to the operation. The user can file all related messages in the associated mission folder.

**Message Options.** Understanding the tools associated with messages increases the efficiency of a unit. Message Acknowledgement and Message Precedence enhance communication. The message acknowledgement function provides the sender the assurance the message was received. There are 3 types of acknowledgement:

1. MA - Machine Acknowledge: The receiving system transmits an automatic response to the sending system when the message is received.
2. OA - Operator Acknowledge: The receiving system transmits an automatic response to the sending system when the message is opened.
3. OR - Operator Response: The operator is required to indicate compliance and give a short written response. The message cannot be closed and the operator cannot go to another screen until he has sent a response back.

Critical messages such as OPORDs, FRAGOs and overlays are sent with the message acknowledgement of "OR". The operator provides information on who reviewed the critical message in the mandatory response back.



Another consideration in transmitting messages is the precedence. Predetermined or default precedence settings are determined by unit SOP and mission. Messages containing information that have an instantaneous impact on the conduct of the operation, such as CFF, SPOT reports, Contact or Engagement Reports or NBC1, should be sent FLASH. Messages such as FRAGOs, Overlays or messages containing less sensitive information should be sent IMMEDIATE. Standard reports such as daily logistics reports, should be sent ROUTINE.

**Outgoing Messages.** Understanding the tools associated with outgoing messages increases the efficiency of a unit. Default distribution, the Message Sent Queue and Quick Send Buttons are some of the instruments intended to assist the user. Most messages have default addressing based on Army doctrine. The exception to this are those listed below:

1. Free Text
2. Fire Support Coordination Measures
3. Position Report/Update
4. Nuclear, Biological, Chemical Report Three (NBC 3)
5. Chemical Downwind Report (CDR)
6. Effective Downwind Report
7. Personnel Status (tied to unit SOP)
8. Task Management (tied to unit SOP)

**Message Sent Queue.** The Message Sent Queue allows the user to sort the sent messages by message type, time, acknowledgement or sent status. The user can also view the message from this screen. The "see details" in the "Message Sent Queue" prompts the user to view the details of the message by selecting the message and select "Execute". The true status of the message is displayed, if a MA, OA or OR was received. The size of the Message Sent Queue can be cleared on a scheduled basis as dictated by the SOP. Recommend the SOP require clearing the "Sent Messages" logs and queues every 3 hours or when the "Sent" queue on the long form message tab appears to be acting sluggish. The user can clear "Sent Messages" under the logs and queues more often, if needed. This should be done when the sent queue is so large that the messages are slow to open.

Caution: If users determine it is time to clear Logs and Queues select reset, all previously settings, saved messages, and overlays are removed from the system.

**Quick Send Button.** The Quick Send Button allows the user to create a message, save it and quickly send it later when needed. For example, a platoon leader tasked with executing an indirect fire mission along an enemy main avenue of approach, can create a quick send button to transmit his Call For Fire (CFF) and send it when the enemy hits his trigger point. Using the Quick Send button is the fastest way to send this message. This is also recommended when creating orders. Orders can be created prior to deploying to the field and saved for sending later (see caution note above). The blank button above the FIPR button can be configured to send a message prepared in advance. Quick Send messages must be saved to a folder. Changes to the message can be done via the Long Message/Edit tab in the corresponding Message Format Dialog Box Tab Group. It is important to remember that message Date/Time Groups have to be updated prior to sending a message.

**Threaded Messages.** Certain messages require specific routing in order for them to be effective. These are called Threaded Messages. These messages are:

1. Fire Support Messages
2. LOGSTAT
3. Combat SITREP
4. Log Task Order
5. Personnel SITREP
6. SPOT Report

The exception to this is the Personnel Status Report and the Task Management Message. The routing for these is SOP driven. Users may add to the Threaded Message addressees but should not delete from the list. These defaults are dictated by Army doctrine and communication architecture (example: the SPOT report feeds into the ASAS intelligence database for correlation into the Joint Common Database for higher SA and analysis). Threaded Messages must follow specific paths in order for information to reach intended personnel, communication system or to feed to the right database. An example of this is the CFF message. It must be threaded properly for interface with AFATDS to occur. The CFF message originator may add as many recipients as desired to the addressee list. If he alters any of the default recipients, the message may not reach AFATDS and therefore, the fire mission will not be processed. If all addressees are not kept on the thread, "orphan" fire missions will occur. Orphan missions are those that lack a Mission Task Order with a target number from AFATDS.

**END OF WORK PACKAGE**







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**OPERATOR MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
**NSN , EIC**

**SITUATIONAL AWARENESS THEORY OF OPERATION**

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## **SITUATIONAL AWARENESS**

Situational Awareness (SA) provides a near real-time, relatively common operational picture of the battlefield to all subscribers of the Tactical Internet. SA includes and automatically displays a terrain database (map), friendly (blue) icons/units, unknown (yellow) icons/units, reported enemy units (red) icons/units, and geo-referenced messages (bridges, obstacles, NBC contamination, etc.).

The answer to every tactical question is "it depends on the situation". Commanders and leaders conduct battlefield problem-solving based on their knowledge of the situation. Situational Awareness provides that knowledge and is a critical asset the Commander has to develop and execute a sound tactical plan. FBCB2 can provide commanders and leaders information that is current, accurate, and available to all echelons of command. This ability to see the battlefield influences the battle in an unparalleled way. But, even with this expanded ability, leaders and commanders must "see" the correct picture.

What the user actually sees depends on how he sets up his system. The SA picture is established through the use of the Situational Awareness Settings tab group in the Admin function and the Filters dialog window. The SA settings tell the system how often to update the network with the platform's position. They also dictate how long blue, yellow, and red icons stay visible. The Filters dialog box allows users to set which icons (unit type and echelon); overlays, labels and geo-referenced graphics are displayed as part of the overall SA picture. Filter settings are a tool used to provide the appropriate Situational Awareness picture, reduce screen clutter and simplify operations. Standard filter settings, established by unit SOP, are vital in order for the Brigade to achieve a tactical picture. Standardized settings also reduce the load on the Tactical Internet resulting in faster data transfer.

SA answers the following three questions:

1. Where am I?
2. Where are the friendly forces?
3. Where is the enemy?

It is important that there be a "standardized tailored SA picture" for all users in the same Task Force (TF) organization. This includes elements that may be under the operational control (OPCON) or attached to the Task Force. The leaders of such elements should query the Brigade or TF S3 for the standard TF filter settings as soon as they come under their control. Filter settings are directed at each command echelon through the use of Digital SOPs. This insures that each echelon sees the appropriate detail one level up, two levels down, and the elements to its front, right, and left. As mission dictates a change in the filter settings, the Brigade S3 advises the Task Force via a FM net call, followed by a free text message. The Task Force does the same for the Company Teams.

FBCB2 simplifies navigation and provides accurate data on friendly forces location. SA is provided to other ABCS systems via EBC in the TOC Server. SA is generated as follows:

**Blue Situational Awareness.** Blue SA is automatic if all systems are operational and there is connectivity. Each individual FBCB2 System derives its own location from the attached PLGR and disseminates its own position over the Tactical Internet. It continuously updates the Common Tactical Picture (CTP) for all subscribers of the TI. There are two Blue SA Filter settings that affect what is displayed on the screen. These are Friendly Filter Settings and Own Platform Settings.

The Brigade, Battalion, and Company SOP dictates platform settings based on mission and movement requirements. When conducting dynamic operations, filter settings should be reduced. When conducting static operations, filter settings should be increased. Again, reducing the amount of transmissions reduces the load on the Tactical Internet. This increases the speed at which information is sent and received. It is important that the SOP ensures that "stale time" settings always exceed transmission time settings and synchronizes the Own Platform Settings and Friendly Platform Settings.

Own Platform Settings allows a user to choose how often (time) and under what circumstances (motion) his FBCB2 transmits its location. Each time FBCB2 sends out its own location, it generates a message on the TI. During periods of limited force movement, the transmission settings should be adjusted to ease the burden on the TI and allow for increased speed of service for critical C2 planning and reporting. Conversely, as force tempo increases, transmission settings should be set to report more frequently. This provides increased fidelity of platform location reporting during critical maneuver periods. The effect on the TI is minimal due to the corresponding drop in C2 message rates as units typically rely more on FM radio transmissions during



combat maneuver. Own Platform Settings also allows the user to report his position automatically, manually or not to report it at all.

Friendly Filter Settings allows the user to tailor the Situational Awareness screen to specific needs and reduce screen clutter. The user can choose to view or filter friendly platforms according to currency, dimension (air, land or sea platforms), unit type and echelon. These settings depend on the user's echelon, mission and platform. SA Filter settings allow the user to set the elapsed time before blue icons begin to fade on their map screen. Operators set the times at which an icon goes stale, old and then is purged from their display. The system measures the Purge Time values from the last time your FBCB2 received a position report from another platform.

Time Lapse reports location based on a time selection. System default setting is six minutes.

Distance reports location based on a distance selection. FBCB2 detects that the distance has changed by comparing PLGR location with last reported location. The default distance is 100 meters.

**Table 1. Sample Matrix for "Own Settings"**

<b>Mission</b>	<b>Stale</b>	<b>Old</b>	<b>Purge</b>
Reconnaissance	15 minutes	20 minutes	24 hours
Counter-Recon	15 minutes	30 minutes	24 hours
Movement to Contact	5 minutes	20 minutes	24 hours
Attack	5 minutes	20 minutes	24 hours
Defend	15 minutes	40 minutes	24 hours
Prepare for Combat	45 minutes	120 minutes	24 hours<
Assembly Area Ops	45 minutes	120 minutes	24 hours

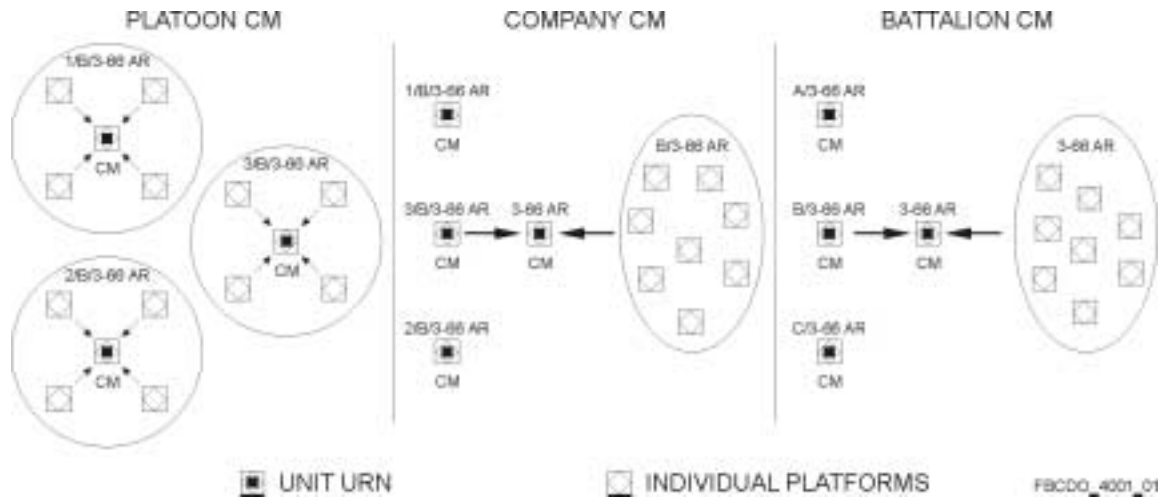
**The Collapse/Expand Function.** The Collapse/Expand Function collapses multiple unit icons under a single unit icon. The unit location is proximate to the Center of Mass (CM) of the collapsed icons. Units collapse in accordance with current UTO. The system only collapses and expands those units or platforms which physically appear on the users SA display. Units that have been filtered cannot be collapsed or expanded.

Some examples of how CM may be used are:

1. Example 1: When collapsing a Bradley platoon: FBCB2 evaluates the location of each of the platoon's vehicles, the individual icons disappear, and a single platoon icon appears at the center of mass of the icons concerned.
2. Example 2: Under a given UTO, an Air Defense Battery is part of an Armor Battalion's Task Force. The battery would collapse into the Armor Battalion's CM icon. Below is an example of CM from a platoon to a battalion.

The method in which FBCB2 calculates CM is shown below and is depicted in the Collapse/Expand Function description. The location of each platform in the selected unit is recorded and evaluated (e.g., PL, PS, WM1 and WM2). A predefined CM radius is established. Platforms that fall outside the radius are excluded from the calculation. Certain vehicles, such as TOCs and commanders, have "weighted" position reports. These weighted positions bias the calculation in determining the CM. The individual icons are replaced with a single unit icon in the proximate CM location. As platforms continue movement, the algorithm re-evaluates the CM and makes appropriate screen changes.





### SA Center Of Mass Calculation

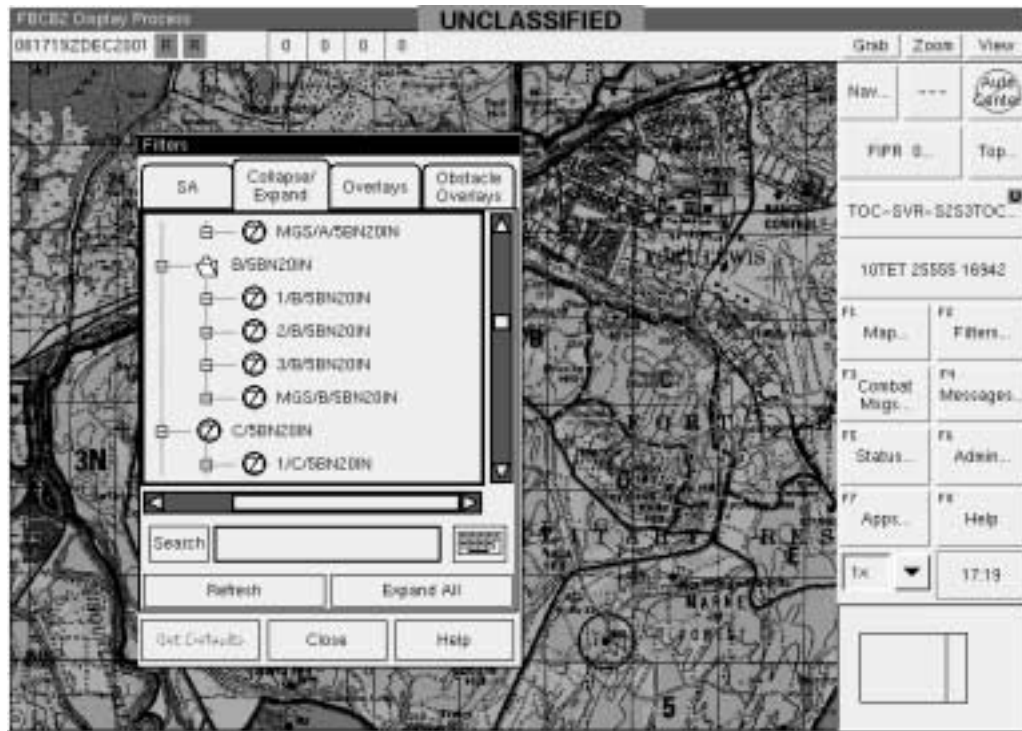
To collapse/expand, select the Filter Button and then the Collapse/Expand tab. Units are displayed according to UTO affiliation. Once a unit is selected to collapse or expand, users must select the "Refresh" button in order for the selection to take effect on the SA map. See Figure: SA Center of Mass Calculation. The "Expand All" and "Refresh" selections expand all the units on the SA map. See Figure: Expand Function.

The FBCB2 refresh rate can slow down or stop if too many blue icons are displayed on the user's screen. Collapsing all units except for the ones the user needs to view speeds up the refresh rate.



### Collapse On Unit Function





### Expand Function

Collapsing on CM is an excellent tool to reduce screen clutter, but it should be used cautiously. Different echelons of command have different requirements for SA. For example, a team or company commander may wish to see a different level of units and subordinates. During execution of combat operations, use of collapse function should also be carefully considered relative to fratricide. It is recommended that the Cavalry Troop, Scouts and other elements forward of friendly forces not be collapsed. The same is true of units sharing a common boundary.

**Red Situational Awareness.** Red SA is a result of user input. There are two ways Red SA is created:

Digital enemy C2 SPOT reports are usually created at the company level and below. The report from FBCB2 should only describe people and/or equipment. Senders should not annotate whether or not the element is a squad/platoon/company etc. The SPOT report automatically creates Red SA/icons on the Brigade area network

ASAS Intelligence Picture. When an observer transmits a SPOT report, the message is sent to the ASAS system supporting the observer (see above). Operators should check their default addressing to ensure the SPOT report is addressed to the battalion S2 or the brigade S2 if a member of BRT. The ASAS operator evaluates these SPOT reports and may enter the report into the ASAS database, where all enemy data is consolidated. The ASAS operator evaluates the SPOT report and, if justified, correlates the numbers and platforms into an enemy unit icon. ASAS periodically provides the correlated intelligence picture to the JCDB in the TOC. The ASAS operators must send the correlated Red picture to either the brigade S2/3 Plans or Ops. Managing Red SA in this manner reduces the number of duplicate icons.

**Red Situational Awareness Settings.** Users have a combination of several settings for Red SA. Under the filters SA tab select "enemy". Based on the selections the exact same tactical situation can appear very different from system to system. As an example: The enemy has 3 tanks, 7 personnel carriers, and 2 engineer vehicles that have been reported via FBCB2 within the last 10 minutes. If "current" is not selected none of the enemy would appear as SA. Likewise, if "ground" is not selected. Under "type", if Engineer is not selected the 2 engineer vehicles would not appear as SA. If the source of info were "ASAS" only, none of the enemy would appear. Users have the option to base selections on:

1. Currency
  - a. Current
  - b. Stale
  - c. Old
2. Dimension



- a. Air
- b. Ground
- 3. Type
  - a. Armor
  - b. Artillery
  - c. Aviation
  - d. Engineer
  - e. Infantry
  - f. Sensor
  - g. Vehicle
  - h. Other
- 4. Source of Info
  - a. ASAS
  - b. FAAD
  - c. Spot Report

**Red SA Settings.** As with Blue SA, the Brigade, Battalion, and Company standardizes Red SA filter settings to achieve a common situational picture. The Red SA settings should be based on the type of operation the enemy is executing. If the enemy is in the offense (dynamic operation), the stale and purge settings should be shorter. This provides a truer enemy picture and prompts users to frequently update spot reports. If the enemy is in the defense (static operation), settings should be longer. Possible Red SA settings are shown in Table: Possible Red SA Settings.

**Table 2. Possible Red SA Settings**

Mission	Stale	Old	Purge
Counter Recon	20 minutes	40 minutes	1 hours
Recon	30 minutes	1 hours	4 hours
Enemy Attack	10 minutes	20 minutes	1 hours
Enemy Defense	30 minutes	1 hours	4 hours

**Geo-Referenced SA.** Geo-referenced messages are C2 messages that create icons linked to a location on the map. Geo-referenced messages are disseminated on the TI as SA. Geo-reference SA can be filtered to display all or hide all in the filter dialog box. These messages are:

- 1. Obstacles Reports
- 2. NBC1 Reports
- 3. Bridge Reports
- 4. Supply Point Status Reports
- 5. Contact Reports
- 6. Engagement Reports

**Warnings/Danger Zones.** The "Danger Zone" tab in the FIPR Button displays the Type, Distance, Direction, Location and Originator of all Danger Zone information received. (See Table: Types of Danger Zones/Safety Radius. Danger Zone information is transmitted in specific JVMF messages as SA data. FBCB2 receives the message and displays the SA data and displays all Danger Zone information in the Danger Zone Tab Group. When the platform penetrates the safety radius of a Danger Zone, the FBCB2 alarm is triggered, an alert message is displayed on the Warnings/Alerts Marquee and an entry is made in the Warnings Tab Group. The Marquee tab group lists all active life-threatening Warnings. The actual size of the Danger Zone is larger than the icon that is depicting it.



Table 3. Types of Danger Zones/Safety Radius

Message Type	Type Of Danger Zone	Safety Radius (Meters)
NBC 1	Chemical	500
Obs/NBC 1	Biological	500
Obs/NBC/Strike Warning	Nuclear	1000
Obstacle Position	Enemy Aircraft	5000
Obstacle Position	Enemy Formation	4000
Obstacle Position	Enemy Field Fortifications	1500
Obstacle Position	Enemy Multiple Rocket Launcher	4000
Obstacle Position	Enemy Air Defense Artillery	4000
Obstacle Position	Enemy Assembly Area	4000
Obstacle Position	Enemy Buildings	1500
Obstacle Position	Enemy Equipment	4000
Obstacle Position	Enemy Command Center	1500
Obstacle Position	Enemy Supply Dump	1500
Obstacle Position	Enemy Rocket Missiles	4000
Obstacle Position	Enemy Vehicles	4000
Obstacle Position	Enemy Armor Combat	4000
Obstacle Position	Enemy Artillery	4000
Obstacle Position	Enemy Mortar	8000
Obstacle Position	Enemy Weapons	1500
Obstacle Position	Enemy Personnel	1500
Obstacle Position	Enemy Unknown	4000
Obstacle Position	Fire Mission	600
Obstacle	Minefield Anti-Personnel	500
Obstacle	Minefield Anti-Tank	500
Obstacle	Minefield Mixed	500
Obstacle	Minefield Unknown	500
Obstacle	Chemical Nerve	500
Obstacle	Chemical Blood	500
Obstacle	Chemical Blister	500
Obstacle	Chemical Choking	500
Obstacle	Booby Traps	500
Obstacle	ABATIS	500
Obstacle	Craters	500
Obstacle	Anti-Tank Ditch	500



**Table 3. Types of Danger Zones/Safety Radius–Continued**

Message Type	Type Of Danger Zone	Safety Radius (Meters)
Obstacle	FASCAM	500
Obstacle	Bunker Strong Point	1500
Strike Warning	Conventional	1000
Threat Warning	NBC	500
Threat Warning	Anti-Aircraft Artillery	4000
Threat Warning	Aircraft	10000
Threat Warning	Air to Air Missile	10000
Threat Warning	Surface to Air Missile	1500
Threat Warning	Surface to Surface Missile	10000
Threat Warning	Air to Surface Missile	15000
Threat Warning	Unknown	4000

**Other SA Tools.****Map Center On Functions.**

Map "Center On" Functions allow the user to center on own platform, a friendly platform, an observed position, a geo-referenced icon or a pre-defined map location. Operators can select the details for an entity and display the hook box associated with the icon FBCB2 is equipped with an "Auto Center" capability which keeps the platform's own icon at the center of the FBCB2 display screen. The following are other "Center On" options:

1. Center on Friendly allows the user to center on any selected platform. If collapse/expand is active, users are able to center on the COM of the unit. See Figure: Center on Unit Platform.
2. Center on Observed allows the user to center on SPOT reports or ASAS reported positions.
3. Center on Air allows the user to center on Air Tracks as provided by the FAAD system.

**Center On Unit Platform**

Center on Location is a tool the user can apply to focus on a specific location or grid coordinate on the map. The user may use this tool to center on a grid coordinate or from a pick list of pre-defined locations. FBCB2 has several default locations available. Users can add to, delete from, or modify the existing location on the pre-defined list. See Figure: Center on Location.





### Center On Location

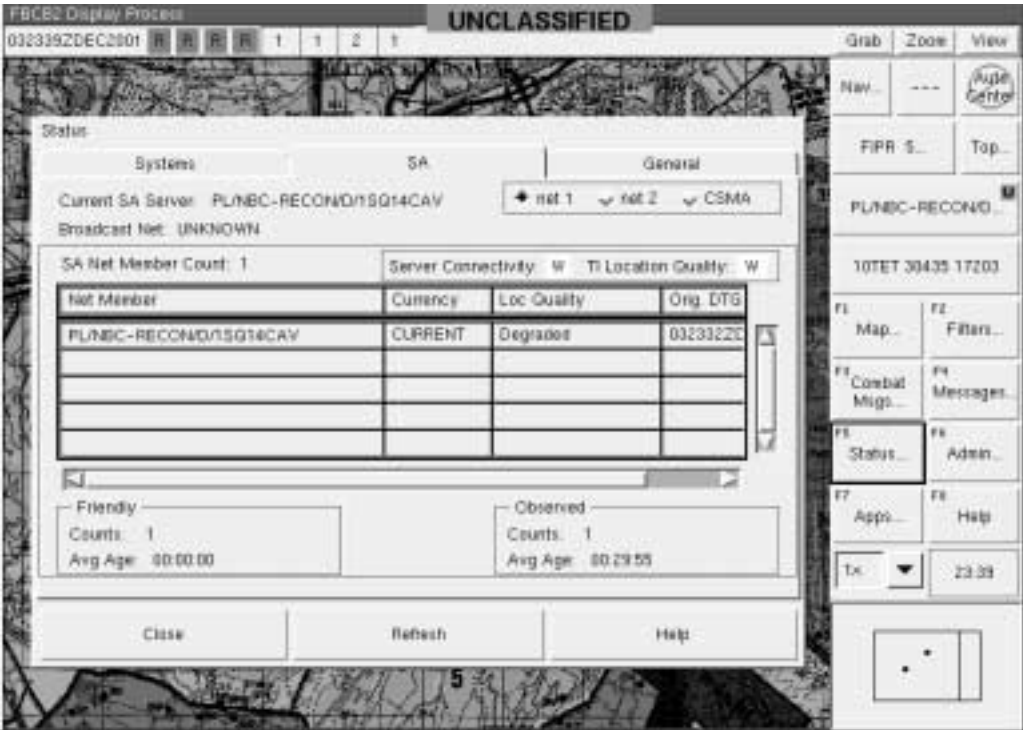
**Terrain Index Reference System (TIRS).** The map "Center On" function is used to create the Terrain Index Reference System (TIRS). To create the TIRS users must add TIRS locations as follows:

1. Select "Map Tab".
2. Select "Center Tab"
3. Select "Location Tab"
4. Select "Edit Location"
  - a. In the "Group Name" text box add "TIRS"
  - b. Under "Location Label" put the numbered TIRS (i.e., TIRS 100) from the OPORD and select okay.
  - c. Add the grid location from the OPORD or select the location by "clicking" on the map.

Add to an overlay by selecting message, create overlay. Scroll down to "Current Operations" and select object, 2525B, Tactical Graphics Fire Support, point single target, add, named: select the correct TIRS from the named location, okay, edit, labels tab, additional info, ok, close. Save as TIRS by mission name or number.

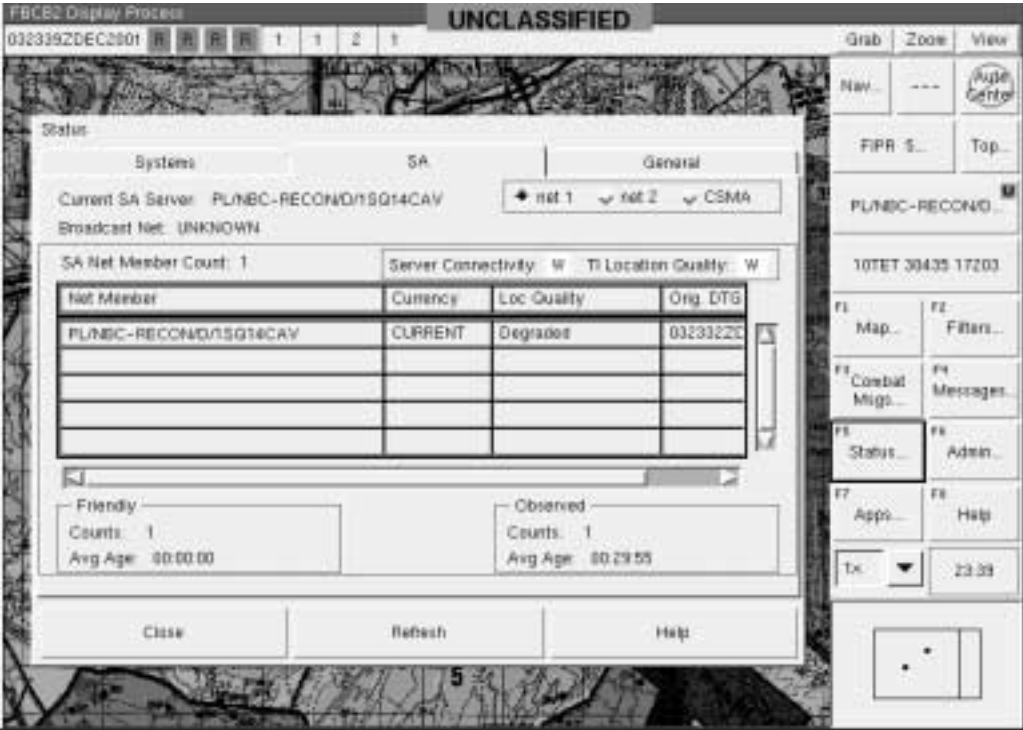
**The Hook Function.** The Hook Function allows the user to retrieve detailed information on the status of any icon, whether friendly, enemy or geo-referenced by selecting the icon on the screen. See Figure: Hook Function. Individual or multiple icons can be hooked using the "Grab" button. The dialog box then allows the user to cycle through the icon details.





Hook Function

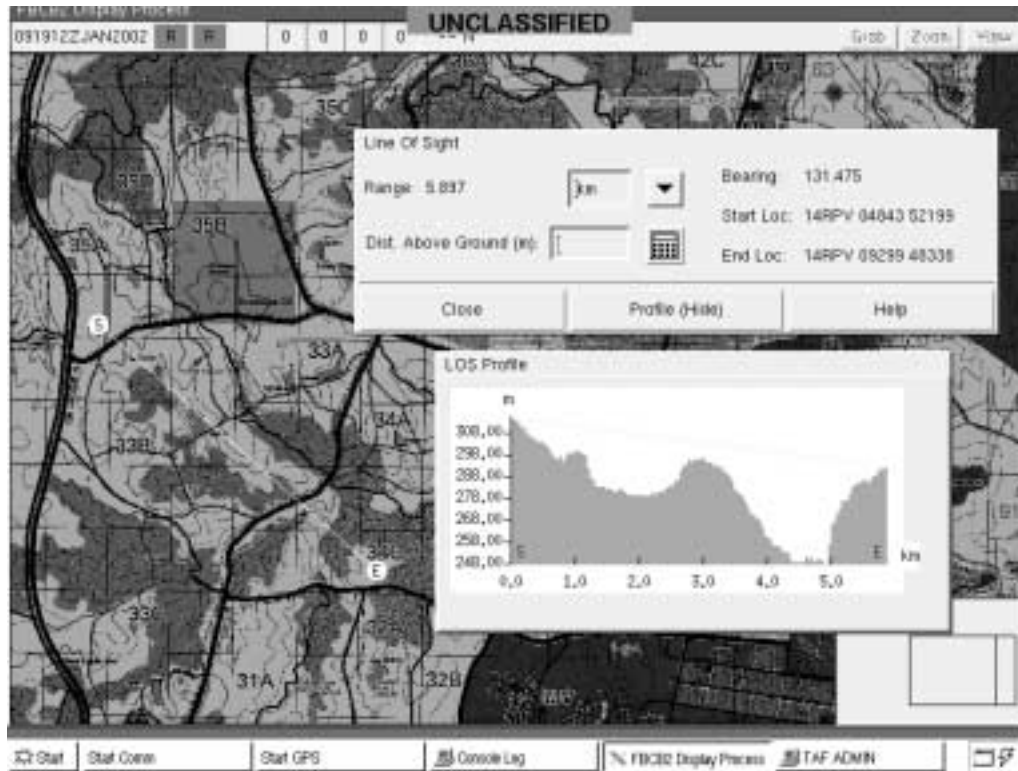
**The Status Function.** The Status Function allows the user to quickly see the number of friendly and observed platforms and shows the status of the SA/C2 server and the server net. See Figure: Status Function.



Status Function



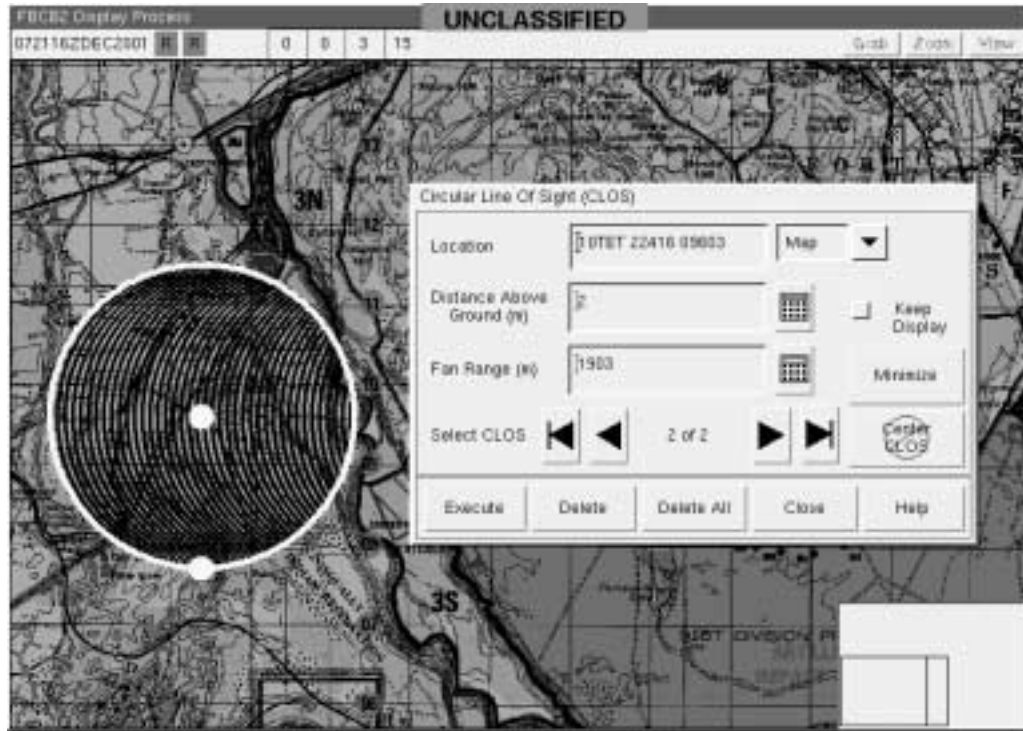
**The Line of Sight Function.** The Line of Sight function allows users to select a start point "S" and an end point "E" on the map. The area between these 2 points is depicted graphically in range and elevation. See Figure: Line of Sight. The user can specify the units of measure depicted for the range and elevation, i.e., Kilometers, Meters, Yards, Feet etc.



**Line Of Sight**



**The Circular Line of Sight Tool.** The Circular Line of Sight tool allows the user to view on the SA map a circular representation of an area from a center point out to an established range. The system uses the color yellow to represent the center point and range fan; it uses a non-shaded area to represent the line of sight and red curved lines to represent a break in the Line of Sight. See Figure: Circular Line of Sight.



### Circular Line Of Sight

**Periodic Reminders.** With the Periodic Reminders function users can create reminders (audio and/ or visual) to alert themselves to perform time sensitive actions (send reports, make radio checks, etc.). Users can create once only, daily, weekly, monthly or "floating" reminders. The time set in the Periodic Reminder is always Zulu time. The visual alert is automatically displayed on the screen. The audible alert is in the form of a beeping sound designed for users equipped with Combat Vehicle Crewman's (CVC) helmets. Selecting "List" can preview a consolidated list of the platform's Periodic Reminders.

**Navigation Function.** The Navigation function provides a navigation tool that is excellent for platoon or company size element moves. It can also be used for vehicles traveling individually to a supply point or link up point. It enhances the traditional strip map or overlay serials receive prior to a move. The route can be plotted on the FBCB2 screen with waypoints (checkpoints) enroute. The screen displays the route and the platform icon as it travels the route. The optimal use of this tool is during limited visibility moves. The route, once it is drawn, can be sent to other platforms. The receiving platform is notified in the FIPR as with any other message. Once opened the route is saved in the navigation tool and can be accessed through "F7 Apps", create, pull down, and select the route. The name given the route by the originator is the same name the route is saved as, in the navigation application.

### DIFFERENCES IN PLATFORM SA DISPLAYS AND ICON COUNTS

**Different Icon Counts.** The friendly icon count can be different on various screens. This can occur for any one or a combination of reasons:

1. Disruption in radio communications (EPLRS, SINCGARS)
  - a. SINCGARS Voice / Data competition.
  - b. Communications links broken (updates interrupted).
    - (1) Out of Range.
    - (2) Interference.
    - (3) Mechanical Failures.



2. GPS Time Synchronization at computer bootup. GPS supplies computer clock at bootup. Large delta in time stamps of position reports can result in data being dropped.
3. System Design Parameters.
  - a. SINCGARS nets protected against overloading from EPLRS nets.
  - b. Each echelon gets only SA within defined boundaries.
    - (1) Unit location plus several kilometer envelope.
    - (2) Echelon.
    - (3) (2 UP / 2 Down + Adjacent).
  - c. EPLRS nets do not have similar overload protection
4. User Filter Settings.
  - a. Data Type of Dimension (friendly, enemy, air, ground).
  - b. Currency (current, stale, old).
  - c. Unit Type (Infantry, Medical, Support, etc.).
  - d. Echelon (PLT, CO, BN, BDE).
  - e. Collapse - Expand.
5. Other
  - a. Time of Operation.
  - b. Time required to collect full SA picture, and Hosts connected to the network may reflect older data.
  - c. Influences of other network systems.
  - d. Data distribution rules within TOCs.
6. SA data received.
  - a. Disruption of Radio Communications.
  - b. GPS Time Synchronization.
  - c. System Design itemmeters.
7. Currency settings (stale, old, purge) settings.
  - a. "Old" ICONS are not included in the count.
  - b. Users can individually adjust these settings
8. SA notification cycle
  - a. Screen refresh rate set to 15-second intervals.
  - b. Refresh intervals are not synchronized between machines.
9. Reporting mode setting for self. If 'off' or 'manual' then others may not see your ICON but you are included in your count.
10. SA Status dialog is not auto refreshed. Users must select the 'Refresh' button to see the latest counts.

#### **Determine Good Data Versus Data Failure.**

1. Display is aging data - sign of data failure. Current to Stale, Stale to Old, icons being purged).
2. SA Count is dropping - sign of data failure.
3. Continued increase in average age of friendly data - sign of data failure.
4. Last heard time from SA distribution point is beyond 5 minutes

#### **Determine The Most Accurate Data.**

1. Friendly Average Age. In general, lower average age indicates recent updates; however it does not guarantee a better picture.
2. Set OLD currency timer to minimum value (i.e., 10 minutes). Higher count of current icon count indicates recent updates.
3. Determine the accuracy of an individual icon by hooking the icon and checking the DTG.
  - a. DTG updates on the display when next position report is received.
  - b. Indicates whether receiving SA updates on hooked platform.

#### **END OF WORK PACKAGE**



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**OPERATOR MAINTENANCE  
DIGITAL OPERATORS GUIDE  
NSN NA, EIC NA**

**DIGITAL BATTLE COMMAND THEORY OF OPERATION**

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**MILITARY DECISION MAKING PROCESS AND TROOP LEADING PROCEDURES**

FBCB2 enhances the ability of commanders and leaders to command and control tactical operations. The enduring principles of doctrine remain intact. Sound tactical plans are the result of a disciplined application of Troop Leading Procedures to receive, plan, and execute a military operation. When commanders and leaders understand the FBCB2 System capabilities, its applications reduce the "fog of war", provide unambiguous communication, and establish a tempo to operations the enemy cannot withstand. As with all systems, operators must understand its capabilities and exploit them. FBCB2 allows the user to see the relationship of terrain, friendly forces and enemy forces (if they are acquired and reported). Fighting on a digital battlefield requires mental agility that is acquired through realistic digital training. FBCB2 provides Command and Control (C2) tools that assist leaders in the decision making process. C2 data is defined as all data other than SA. Below are some specific FBCB2 applications that are available and are useful in the application of the Troop Leading Procedures.

Situational Awareness is the ability to maintain a constant, clear mental "picture" of the tactical situation. This picture includes an understanding of relevant terrain and of the relationship between friendly and enemy forces in time and space. It also includes the ability to correlate battlefield events as they develop.

For commanders and leaders, situational awareness is the key to making sound, quick tactical decisions. It allows them to form logical conclusions and to make decisions that anticipate future events and information. A critical benefit of Situational Awareness on the part of all leaders is a reduction in fratricide incidents. Situational Awareness also gives leaders the ability to compress the time necessary to conduct troop-leading procedures. This is critical when there is limited time to plan and prepare for an operation.

**FM VS DIGITAL COMMUNICATIONS**

Commanders do not rely on digital communications alone. Digitization does not eliminate the requirement for FM communications. The decision to use FM vs. FBCB2 depends on the situation and unit SOP.

**Digital Messaging.**

The following is a recommended list of digital messages to be used at soldier, platoon and company level:

1. Transmitting graphics and orders when the situation allows.
2. Routine reporting such as personnel and logistical status or requests.
3. Enemy spot reports. (It is critical to pass spot reports via FBCB2 as this creates an enemy icon transmitted network wide.)
4. Planned Call For Fire (CFF) missions.
5. Digital NBC 1 report. This creates a contaminated area icon across the network.
6. Obstacle Reports create an obstacle icon across the network.

**FM Radio.**

FM radio remains the primary means of communication after crossing the Line of Departure (LD) because it's more responsive, multiple stations can monitor the net and parties convey emotion during voice transmission – a critical tool in assessing and understanding the battlefield situation. Light discipline in night operations may dictate the use of FM communications. For example, Brigade Cavalry Troop soldiers may go to blackout FBCB2 operations and send SPOT reports via FM to a vehicle (usually the Troop CP which is stationary and postured to use the FBCB2 display while maintaining light discipline). The CP could generate and manage FBCB2 SPOT reports based on the FM SPOT reports and updates. FM radio is recommended as the primary means of communication for:

1. Initial contact/SPOT reports.
2. Coordinating operations when in contact or moving.
3. CFF on targets of opportunity; particularly moving targets.
4. Subsequent adjustment of fires on planned and unplanned targets.
5. Urgent MEDEVAC requests.
6. Enemy Air.



## GRAPHICS AND OVERLAYS

### Creation And Transmission Of Digital Graphics.

Digital graphics provide excellent graphical control measures applied in battlespace management. Simplicity is the rule for effective digital graphics. Simplicity reduces file size, screen clutter, transmission time and the volume of digital traffic on the Tactical Internet (TI). FBCB2 allows users to create the echelon/type of the overlay as part of the file name. When the overlay is created, the type is defined. For example:

1. Brigade level overlay should be created as "Higher Echelon 1".
2. Battalion or Task Force level overlay should be created as "Higher Echelon 2".
3. Company level overlay should be created as Current Operations.
4. Service Support overlay should be created as Combined Service Support overlay.
5. Normally, brigade requires TF operations overlays. Company overlays should be merged to create consolidated TF overlays. As stated previously, users should filter out graphics that may be duplicated in other overlays to reduce clutter and transmission time. A recommendation for organizing overlay flow is:
  - a. Brigade sends their Higher Echelon 1 overlay to the TF.
  - b. The TF opens the overlay and saves it as the same reference name and keeps it displayed on their screen.
  - c. The TF creates a Higher Echelon 2 overlay adding their operations graphics but, prior to saving it, filters out the graphics from brigade.
  - d. TF saves its Higher Echelon 2 overlay with a battalion reference name and sends both brigade and TF overlays to the company Command Posts (CPs).
  - e. Company CP opens each overlay and saves it separately.
  - f. Company CP loads both overlays using the overlay filter function, and keeps them visible while building their Current Operations overlay. Prior to saving the overlay (with a company reference name), filter out both TF and brigade graphics.
  - g. Company CP then sends its Current Operations overlay to the TF S3.
  - h. TF S3 receives all the company overlays, consolidates them as one and sends it to brigade.
  - i. Brigade would have the TF overlays on the original brigade overlay.
6. By using this method, the overlays stay small and manageable. The size of the file is important when sending over the TI. Users may calculate the size of the overlay while creating it by periodically checking and recalculating the size of it on the "Overlay Toolbox"; "Overlay Tab". As with any message, it is sent multicast if the overlay is less than 1 megabyte, including the header. Users may find graphics easier to view with the background map color faded. Tips to consider when creating overlays/graphics are:
  - a. Create boundaries and Phase Lines as separate overlays.
  - b. Create "areas" (ATK POS, OBJs, etc.) as separate overlays.
  - c. Create separate CSS overlays (MSRs, TF Support Areas, Unit AAs, BSA).
  - d. Create Engineer Obstacle overlays.
  - e. Combined Supply points and Logistical Release Points, which move frequently, as a separate overlay.
  - f. Create Attack graphics (Main Axis, Secondary Axis, etc.) as separate overlays.
  - g. Create any additional requirements/control measures as separate overlays.
7. Once overlays are received in the FIPR queue, the recipient has the option to build one overlay from the components or display them separately and manage visibility via the Filter button.
8. The brigade dictates how overlays and orders are named. Standard naming conventions reduce the time users spend searching for specific messages or overlays.



### Graphic Tips For Calculating Overlay Size.

All viewable overlay graphics become part of the overlay when creating or sending graphics. Duplication of boundaries, etc., in overlays results in screen clutter and increases transmission time. For example, the Fire Support overlay should only display targets and critical control measures, and the Obstacle overlay should only display obstacles. The only recommended duplication is adding the MSRs to the Ops overlay and the CSS overlay. Graphic Tips Quick Reference:

**Table 1. Graphic Tips For Calculating Overlay Size**

ITEM	SIZE	COMMENT
Date Time Group	4 bytes	
Message Header	17-18 bytes	
Single Character (letter or number)	1 byte	
Single Point Icon	21 bytes	
Square	80 bytes	
Straight Line	30 bytes	Line length does not affect size
Additional Line Points	7 bytes	Adds 7 bytes per point to original line
Target Label	Up to 21 bytes	
Target Symbol	23 bytes	5 character alphanumeric designator

### Boundaries.

Doctrinally, boundaries are used to identify a unit's area of operation and act as fire control measures designed to reduce the risk of fratricide. The application of boundaries is changing as a result of SA and digitization. Digital units may use boundaries in a more general way by not drawing them on identifiable terrain. This general method is easier when creating and sending overlays. Unfortunately, it creates problems for units on the battlefield in clearing and coordinating fires and positions. It can also create problems for those units that do not possess FBCB2 and rely on traditional graphics and FM communications. If simplified line boundaries are drawn digitally, it is recommended the OPORD or FRAGO provide more detail. Example: provide rough boundaries via that overlay, then "spell it out" in the OPORD. Example: The northern boundary is the international border, the western boundary is highway 101; Phase Line DOG is Turnover Creek from the 24-39 gridline. The optimal solution is to have boundaries on identifiable terrain.

### Phase Lines.

Digitization may affect the traditional C2 use of phase lines. Phase lines are also used as triggers for phasing operations and for position reporting. The utilization of phase lines is especially critical for the C2 of units that do not possess digital capabilities. Company and platoon level elements should include phase lines on their overlays if the BCT displays them in their graphics and/or if they have elements without the FBCB2 System.

### Terrain Index Reference System (TIRS).

TIRS is a numbered reference point associated with identifiable terrain. It is usually depicted as a cross (tic mark) with a number. Some units use TIRS in lieu of all other C2 graphics. TIRS is an effective tool in digital units because the tic marks reduce screen clutter and are easy to create and send. Fragmentary orders that use TIRS can be given clearly and quickly.

### Color-Coding.

Current doctrine (MILSTD 2525B and FM 101-5-1/MCRP 5-2A) dictates what colors are used in depicting certain activities or elements. The FBCB2 System has a variety of colors that can be applied to graphics to enhance clarity. IAW FM 101-5-1 MCRP, obstacles traditionally are reflected in green and chemical contamination in yellow. Templates of enemy doctrinal locations can be a standard color, such as purple, and the actual enemy forces in red. Colors can be assigned to task forces, missions or individual units. For example, the brigade may decide that BCT graphics be in black, TF A graphics in blue, TF B graphics in brown and TF C graphics in orange. Color-coding should be standardized and included in the brigade and task force TACSOP.

### Obstacle Overlays.

When a multiple point object obstacle overlay is received, it automatically posts to the user's map screen. Operators must open the overlay from the incoming message queue to view the complete overlay. Obstacle overlays are different from Obstacle and



Bridge Reports. Obstacle and Bridge Reports are sent as SA. FBCB2 calculates the center of mass of multiple point obstacles in these reports in order for them to be sent as SA.

### UNIT TASK REORGANIZATION (UTR)

The FBCB2 System has the capability to re-task organize units, battalion size and lower, as the mission dictates. When the UTO is changed, the associated elements of the TI are changed accordingly. The events triggering a UTO change should be addressed in the OPORD and unit SOP. The Task Force TOC should send an FM alert, followed by a free text message, prior to a UTO change. The S3 develops and the brigade commander approves anticipated different UTOs. The S-6 builds the UTOs. Listed are the times required by the TI for the UTO change to take effect:

**Table 2. Unit Task Reorganization Times**

ELEMENT	RE-TASKED TO	WITH IN	TIME FOR KEYPLATFORMS	TIME FOR OTHER-PLATFORMS
Platoon	Different Co	Same BN/BDE	5 minutes	5 minutes
Company	Different BN	Same BDE	10 minutes	10 minutes
Platoon	Different BN	Different BDE	15 minutes	60 minutes
Company	Different BN	Different BDE	15 minutes	90 minutes
Battalion	Different BDE	Same Div	30 minutes	120 minutes

### Re-Entering The Digital Net.

Once a UTO change is directed, all platforms reboot their FBCB2. Affected units and platforms must manually change FM Hopsets as required. There is no need to change Radio Set Identification (RSIDs) on EPLRS equipped platforms. As FBCB2 reboots, it makes its own internal corrections to appropriate message routing and database tables. Units should verify FBCB2 UTO fidelity by conducting C2 digital radio checks as explained below:

1. Platoon and below platforms send a Free Text comms check message to the gaining company CP. This message should be sent with a Machine Acknowledgement (MA). The MA does not require the operator to answer the message. The sender automatically knows his traffic is reaching the correct addressee. In turn, the gaining company sends a Free Text, MA, communications check message to all platforms in the new command multicast group.
2. Each platform in a company size element executing a UTO change performs a digital comms check, MA, with the TF assistant S3. The assistant S3 then sends a digital Free Text message, MA, to all the platforms in the new command multicast group.
3. The S3 reminds all users to update their default addressing in their Fire Support Messages to the correct AFATDS that is now supporting them. Otherwise, any Fire Support Messages are sent to the wrong address and are not processed.

### RED SITUATIONAL AWARENESS MANAGEMENT

The FBCB2 SPOT report picture can be managed network wide. Once a SPOT report has been sent digitally, the originator or users assigned role access level of 3 or 4 (for example: commanders, Scouts or MPs) can modify or delete the location of SPOT reports. It is important for originators of SPOT reports to ensure subsequent modifications to, or deletions of (if the enemy is destroyed or contact lost) SPOT report locations are sent out digitally. Otherwise, the common red picture becomes cluttered and misleading. Ideally, the initial observer is responsible for keeping the report and it's associated icon updated until the enemy is either destroyed or "handed off" to another observer.

It is important to understand that the ASAS intelligence picture adds to the existing enemy SA (already generated by the FBCB2 System) and could cause the screen to appear to have duplicates. To avoid this, the user has the option to display the FBCB2 Red SA picture, the ASAS picture or both. Generally, before a mission starts, the ASAS picture should be displayed. This provides a complete enemy picture of the total battlespace. When a mission begins, users should rely on the real-time FBCB2 SPOT reports, as they are more focused and timely. Unit SOP should be to display the FBCB2 SPOT reports and dictate pre-defined times (or "on-order") to look at the ASAS feed for the correlated picture.

### All Source Analysis System.

FBCB2 and ASAS interface as follows:

1. First, FBCB2 sends ASAS the SPOT Reports.



2. ASAS sends an Observed Position Report to the Brigade Plans or Ops MCS.
3. The S2 at the TOC correlates the data with other information sources and produces the Intelligence Overlay.
4. The interval in which ASAS is received can be adjusted depending on the mission, enemy scenario, etc. Just as with "Own Platform Settings", filters should be lengthened during enemy static operations and shortened during their dynamic operations. This reduces the burden on the TI while providing an accurate enemy picture. Filter settings allow the user to turn the receipt of ASAS reports on or off.

Note: ASAS operators must go in to their Enemy Interoperability Destination screen and select to turn EBC on in order for EBC to receive the Red correlated picture. If this does not occur, FBCB2 users do not receive the correlated Red picture. Recommend ASAS users set their systems to push the correlated Red picture every (1) minute or as determined by unit SOP.

## **TACTICS, TECHNIQUES, AND PROCEDURES (TTP)**

Commanders use the capabilities of the FBCB2 System to enhance the operations of their organizations. The explanation of the capabilities by specific operations is too broad in scope. The following examples should serve as food for thought in developing a unit-specific list of TTPs.

### **Indirect Fire Planning.**

No fire areas can be depicted by overlay to indicate where personnel or units are located that do not have FBCB2. An example is a dismounted LP/OP.

The line of sight and circular line of sight tools can be used to plan observer locations for planned targets, named areas of interest or targeted areas of interest. Once observers are on the ground they must confirm they can observe the assigned area.

Free fire areas can be depicted by overlay to inform personnel and units of their location. The Free Fire Area does not provide an alert or warning.

A Call for Fire can be prepared in advance of an anticipated event and assigned to the Quick Send button. When the event occurs the sender insures the Call for Fire is still correct or makes only the necessary corrections and then sends it.

### **Time Distance Considerations.**

Through the use of the Route Tool one can plan a route, and determine the time to traverse the route by selecting the desired speed. This procedure does not substitute for a route reconnaissance.

### **Fire Control and Distribution.**

FBCB2-equipped platforms can precisely pinpoint their own location and depict their sectors of fire. By using the circular line of sight tool, platforms can depict dead space in their sector of fire and plan the use of protective obstacles and indirect fire to cover the dead space or canalize the enemy into areas where direct fire can be employed. Identification of dead space must be confirmed on the ground. Once it is confirmed, dead space is included in the platform's sector of fire. Individual platforms send their sector of fire sketch to their leader who can consolidate several sectors into a unit fire plan. The complete plan contains the appropriate fire control measures the leader intends to implement. (Trigger lines, engagement areas, reference points, alternate positions, etc.) The addition of observation points, obstacles, and indirect fire plans complete the unit's fire plan. The consolidated plan is sent to higher headquarters and to subordinates.

### **Terrain Analysis.**

Observation and Fields of Fire are analyzed using the Line of Sight and Circular Line of Sight tools. The planner selects locations from where he wants to determine if there exists observation and fields of fire. Consider using 4x in order to be more precise in selecting locations. The Line of Sight (LOS) Tool displays terrain features, along a single line, that are obstructions. The Circular Line of Sight Tool analyzes terrain from a single point to a radial distance selected by the operator. Within the circle, areas that are not observable are depicted with red curved lines. The Line of Sight tools consider only terrain features. LOS does not identify vegetation or manmade features.

Cover and Concealment is analyzed using the same tools and methods to determine observation and fields of fire.

Obstacles are identified using the Route tool. The Route tool identifies slopes that are not trafficable based on the user's input of equipment capabilities. GO, SLOW GO, and NO GO terrain is determined based on the slope. As with the Line of Sight tools, vegetation and manmade features including roads are not identified. Also keep in mind the slope calculations are along a single line.

Key Terrain is identified using the Line of Sight tools in the same manner as described with observation and fields of fire. The planner selects terrain he thinks may dominate an area and/or an avenue of approach.



Avenues of Approach are analyzed using the Navigation tool. Using the Navigation tool, "Analyze Route" button, the planner determines observation and fields of fire along the entire route to a distance selected by the planner. The use of this tool can also determine observation and fields of fire, cover and concealment, obstacles, and key terrain along the route.

**Movement.**

Simplicity, a Principles of War states, "Prepare clear, uncomplicated plans and concise orders to ensure thorough understanding". What once was complicated and difficult the FBCB2 System makes routine. Commanders can now plan more intricate operations that have more moving parts. The platforms and units have accurate near real time data on themselves and other units. Commanders have the capability to accurately monitor the operation as a whole, rather than from the limitations of voice communication and personal line of sight. The synchronization of movement and fires is now a matter of execution. Getting to the right place at the right time is more achievable than ever before. A plan that calls for complex movement over great distances, in adverse conditions and in coordination with other units, is possible rather than dismissed as being too difficult.

**Reporting.**

Routine reports can be prepared and saved with the proper addressees in advance. They can then be updated and sent at the appropriate time. The periodic reminder tool is used to remind the user when a report is due.

**Road Marches And Assembly Areas.**

The purpose of a road march is to relocate rapidly, not to gain contact with the enemy. Road marches are normally conducted using fixed speeds and timed intervals. Additionally Road Marches involve moving long distances and normally culminate in the occupation of an assembly area. Planning for a road march includes the following:

1. Quartering party
2. A movement route
3. Control measures
4. Rate of march
5. Formations
6. Intervals

The Unit SOP establishes the composition and size of the Quartering Party. The following are considerations for the employment of the FBCB2 System in the accomplishment of quartering party tasks:

1. Route Reconnaissance: The quartering party digitally reports on the condition of the route. It pinpoints locations that may impede movement, sends graphics of bypasses, and edits the planned route to avoid chokepoints. The need for TCPs is reduced if not eliminated.
2. Assembly Area: The quartering party identifies individual positions with sectors of fire and sends them digitally to the main body. Each platform receives its position prior to reaching the assembly area. Once received each platform adds a leg to his route and moves into position. The unit moves through the RP and occupies its assembly area without guides. The quartering party monitors the progress of the main body and is in position to receive the main body without voice communication. Likewise the commander is able to monitor the progress of the quartering party and with confidence know if it is prepared to accept the main body. Without the need to provide guides, or a reduction in the need for guides, the quartering party can concentrate on other duties, such as laying wire for communication, reconnaissance of the area, maintaining security, or setting up the Command Post.
3. Routes can be easily, quickly, and accurately disseminated to all platforms. Movement Times can be calculated based on the rate of march. Commanders monitor progress of the operation without voice communication. Due to enhanced SA, open columns during limited visibility are feasible as are increased speeds. If desired, infiltration by smaller units is possible. Infiltration enhances security, deception, and dispersion.

**Passage Of Lines.**

A passage of lines is a complex operation requiring close supervision, detailed planning, coordination, and synchronization between the unit conducting the passage and the unit being passed.

Planning and Coordination: The stationary unit digitally sends its operations, fire support, and obstacle graphics to the passing unit as soon as possible. Keep in mind that the passing unit may not be in the normal distribution of the stationary unit's plans and graphics. The stationary unit develops the passage lanes by using the navigation tool and sends them also, so the passing unit can disseminate them to their subordinate units. The passing unit may then plan its passage. However, face-to-face coordination is still critical. Agreement must be reached on exchange of control of the sector or zone, deception, communications, recognition signals, and exchange of combat information.



Execution: The stationary unit must be able to identify each platform of the passing unit on the FBCB2 screen. This may require a change in filter settings and the collapse/expand function. (Table 3) During coordination units exchange their FBCB2 procedures to insure their own and friendly SA settings are compatible with each other. The headquarters ordering the passage should do this, particularly if there are more than two units participating.

Collapse/Expand Function: The stationary unit and the passing unit adjust their Collapse/Expand Function to show the same information. The function is expanded to show all the platforms of the passing unit. The function is collapsed to show the center of mass of the stationary unit at platoon level. This provides for a complete picture of all of the passing unit's platforms and reduces clutter on the screen.

Indirect Fire Support: Consideration should be given to initiating all calls for fire with voice communication. The stationary and passing units are monitoring each other's voice net and can readily clear or check fires. The digital call for fire is a threaded message, thus invisible to the unit, not requesting fires. It is possible for the units to conduct a radio net join but this causes a delay in communication once the battle handover takes place and the units return to their own net. If a radio net join is considered, the unit that is assuming responsibility for the fight remains on its own net.

**Table 3. Possible Admin And Filter Settings**

ADMIN	Stationary Unit	Passing Unit	Rearward Passage	Forward Passage
Own Settings	30 Minutes/ 100 Meters	5 Minutes/ 50 Meters		
Friendly				
Stale	60 Minutes	60 Minutes		
Old	90 Minutes	90 Minutes		
Purge	4 Hours	4 Hours		
Observed				
Stale			10 Minutes	10 Minutes
Old			30 Minutes	60 Minutes
Purge			4 Hours	4 Hours
Filters SA	ALL ON	ALL ON		

#### **Pre-Combat Checks (PCC).**

Pre-Combat Checks (PCC) are a critical part of a unit's combat readiness. PCC should be standardized and part of unit SOP. Some suggested PCC for a digital unit are:

1. Message folders established.
2. Message address groups established
3. Message addressing settings for all message types set (default settings should not be deleted).
4. Correct Friendly and Red Filter Settings.
5. Correct "Own Settings".
6. Correct GPS, SINCGARS and/or EPLRS fills and settings.
7. MEDEVAC Call Signs and frequency set in "Platform Setting Dialog Box".

#### **END OF WORK PACKAGE**







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**OPERATOR MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
**NSN , EIC**

**MISSION DATA LOADER THEORY OF OPERATION**

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**Description**

The Mission Data Loader System (MDLS) provides commanders and staffs with the capability to distribute information to FBCB2-equipped platforms via a ruggedized portable media, when distribution of that information over the lower tactical internet is not feasible. The MDLS provides interface between the Army Battle Command Systems (ABCS) and FBCB2. The MDLS facilitates movement of mission data from the TOC down to platform level. MDLS provides the interface necessary for data exchange among the various platform information systems. Mission data includes items such as Signal Operating Instructions (SOI), security passwords, digital terrain/map data, unit task organization data, operational orders, plans, overlays, matrices, and graphics.

**BRIGADE LEVEL**

**Initiate.**

As a part of normal operational planning, or upon receipt of Division/higher level orders, the Brigade Staff generates an OPORD, plans, graphics, and overlays in accordance with FM 101-5, Staff Organization and Operations. The Engineer Coordinator (ENCOORD) manages the digital terrain data storage device and provides appropriate digital terrain data to staff users prior to generation of overlays and appropriate graphics. The ENCOORD also generates and provides map set(s) to the S6 for replication/duplication and distribution to subordinate and supporting units by means of the MDLS. The BDE S2 generates and assigns passwords to be provided to the S6 for inclusion in mission data. Respective staff sections utilize BFA/ABCS software systems to digitally generate orders annexes, overlays, matrices, and graphics.

**Organize Package.**

Respective staff functions develop annexes, overlays, and graphics in coordination with the BDE S3 and provide finished products to the S3 in digital form. The BDE S3 consolidates input from respective staff sections, assembles and finalizes the entire OPORD/OPLAN with supporting graphics and overlays, and creates a downloadable file.

**Replicate.**

The BDE S3 forwards that complete downloadable file(s) to the BDE S6 for creation of a mission data set(s). The S6 determines the number of Data Transfer Device/ Mission Data Loader (DTD/MDL) required. He also replicates/duplicates those mission data set(s) onto DTD/MDL for distribution to subordinate and supporting units in accordance with unit SOP, unit task organization, and specific mission support requirements.

**Distribution.**

BDE S6 for gathers information to create mission data sets and the distributes data sets to subordinate elements. The S6 uses the create device to develop both administrative data loads and operational data loads. Administrative data loads include map set data, password security lists, and SOI data, along with software patches and other administrative data. Operational data loads include C2 messages, UTO, OPORDs/OPLANs and supporting overlays, matrixes, and graphics. These two types of mission data loads may be distributed either simultaneously or separately depending upon the situation and unit SOP. With final verification of mission data input and tasking support from the S3, the S6 replicates/duplicates sufficient DTD/MDL devices to satisfy organizational/mission needs. The S6 must consider the dispersion of FBCB2 throughout the organization and the number of platforms. The S6 distributes the finished DTD/MDL devices using secure couriers hand-carrying them for downloading to each staff element, support unit, and appropriate supporting elements within the TOC and CP area. The S6 also ensures that DTD/MDL devices are provided to subordinate and supporting units in accordance with unit SOP, by secure courier, LNO, runner, or hand-off to subordinate unit staff officers or commanders during orders briefings and/or meetings.

**Unpackage/Install.**

BDE S6 Couriers or LNOs hand-off DTD/MDL to subordinate battalion commanders, supporting unit commanders, or designated unit personnel. Designated personnel are responsible for ensuring that the DTD/MDL is used to download mission data into each digital platform system.



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## **BATTALION LEVEL**

### **Initiate.**

Upon receipt of MDLS data from Brigade, Battalion Staffs edit information and create an appropriate subset for further distribution to supporting and subordinate units. They generate OPORD, plans, graphics, & overlays in accordance with, FM 101-5, Staff Organization and Operations. Respective staff sections utilize BFA/ABCS software systems to generate specific annexes, overlays & graphics.

### **Organize Package.**

Respective staff functions develop annexes, overlays, and graphics in coordination with the BN S3 section and provide finished products to the S3 in digital form.

### **Replicate.**

BN S3 consolidates input from respective staff sections, assembles and finalizes the entire OPORD/OPLAN with supporting graphics and overlays, and creates a downloadable file. That file(s) is forwarded to the S6 for creation of mission data set(s). The S6 determines the number of DTD/MDL required. He also replicates/duplicates those mission data set(s) onto DTD/MDL for distribution to subordinate and supporting units in accordance with unit SOP, unit task organization, and specific mission support requirements.

### **Distribution.**

BN S6 is responsible for distribution to the subordinate elements. With support and tasking support by the S3, the S6 distributes the finished data sets using secure couriers who hand carry them to subordinate staff elements, units, and appropriate supporting element within the TOC and CP area. The S6 also ensures that DTD/MDL are provided to subordinate and supporting units in accordance with unit SOP, by secure courier, LNO, runner, or hand-off to subordinate unit staff officers or Commanders during orders briefings and/or meetings.

### **Unpackage/Install.**

Couriers hand the DTD/MDL off to subordinate company commanders or designated unit personnel for download and installation of mission data to FBCB2/IC3 systems on each platform.

## **COMPANY LEVEL**

The company commander or his designated representative accept DTD/MDL from the Battalion S6 and facilitate mission data transfer to the Commander's individual FBCB2/Integrated Command, Control, and Communication (IC3) system, and other company level digital systems. Edited DTD/MDL data is also provided to subordinate platoon leaders or their representative to facilitate rapid downloading of appropriate mission data to individual platform level.

## **PLATOON LEVEL**

The platoon leader or designated representative accepts DTD/MDL from the company level representative and uses the DTD/MDL to transfer mission data into each platoon level, platform mounted, FBCB2/IC3 system. The designated representative hooks up the DTD/MDL to the FBCB2/IC3 platform and downloads/installs each product set into the appropriate operational area. DTD/MDL hardware must be provided security at all times and returned to the company point of contact to facilitate further downloading of mission data into other platoons level digital systems and/or return to the company level representative.

## **SECURITY**

Mission data in the DTD/MDL must be handled as classified material at all times. The BDE and BN S2s must verify users of mission data running in the secret mode have appropriate security clearances and are authorized access. Positive control must be maintained over DTD/MDL device throughout the entire organization, replication, distribution, and unpackaging process. All DTD/MDL are returned to the generating staff element to ensure accountability and availability for future mission data loads.

## **END OF WORK PACKAGE**



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**OPERATOR MAINTENANCE  
DIGITAL OPERATORS GUIDE  
NSN , EIC**

**SYSTEMS SECURITY THEORY OF OPERATION**

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**OPERATIONS SECURITY (OPSEC)**

This is an outline of security considerations for FBCB2. Detailed procedures are in the various Army Regulations.

1. Maintain security-conscious users by practicing their operations security procedures as noted in the Security Manual/ Standing Operating Procedures and FBCB2 Security Policy Manual procedures.
2. Ensure all personnel using FBCB2 are identified, have a legitimate need-to-know (NTK), and have a proper security clearance.
3. Provide security training and awareness programs IAW AR 380-19.

**PHYSICAL SECURITY**

1. The physical security foundations for the FBCB2 include lock and cable application to secure the Display Unit (DU), Hard Disk Drive Cartridge (HDDC), and the Computer Unit (CPU) to various vehicles.
2. Control toughbook laptops and DTD/MDL storage media IAW AR 380-19 and local SOP.
3. Inventory and account for hardware components IAW AR 190-13 and AR 190-11.

**SOFTWARE SECURITY**

1. Installing the FBCB2 software is the process of downloading the operating system and the supporting FBCB2 applications onto the FBCB2 HDDC. It is a privileged function of the FBCB2 Configuration Manager. This process is performed only from the authorized load media as delivered from the Material Developer's organization.
2. FBCB2 operates at a System High Level (SHL) of either SEVERET (S) or UNCLASSIFIED (U). When initialized from load media, FBCB2 operates at U. Before FBCB2 operationally to processes classified Command and Control (C2) data the SHL must be changed to S.
3. Changing the SHL from U to S is a privileged, offline Session Manager mode available only to Special Access users via the System Administration function.

**DOCUMENT AND MEDIA SECURITY**

1. Classified documents are labeled and secured IAW AR 380-5 and AR 380-19.
2. Classified FBCB2 HDDC, DTD/MDL storage media and toughbook laptop RDD are labeled and secured IAW AR 190-51, AR 380-5 and AR 380-19.
3. Containers that are in accordance with the requirements of AR 380-5 should be used for movement and storage of the removable media that may contain classified information.
4. The "Destroy FBCB2" button is used to prevent FBCB2 compromise.

**PERSONNEL SECURITY**

In accordance with the principle of "least privilege", access to the FBCB2 is controlled and limited to individuals having the proper security clearance and /or need to know. All personnel having access to the FBCB2 while in the SECRET high mode and a SECRET UAL must have at least a SECRET level security clearance.

**COMMUNICATIONS SECURITY (COMSEC)**

1. COMSEC requirements are detailed in AR 380-19, the Security Classification Guide and the FBCB2 V3.4 Software Message Security Procedures TTP.
2. FBCB2 rejects messages when:
  - a. Security classification of message exceeds the user NTK.
  - b. Message not addressed to URN the system configuration.
3. Unclassified Users can only access Unclassified and not mark messages as Classified.
4. Secret Users can create and remark Unclassified and Secret messages.
5. FBCB2 clears message logs, queues, and user message folders when reconfigured from Secret to Unclassified.



6. FBCB2 responds to authentication requests from INC/Router and does not communicate with host that fails.

## **INCIDENT RESPONSE**

1. Report any loss, intrusion or security breach below to SO IAW local SOP.
2. Any unauthorized access/attempt to access.
3. Abnormal system responses.
4. Inconsistent/incomplete security markings.
5. Malicious software interference
6. Countermeasures detection system alerts.
7. Receipt of K00.3 JVMF security message. K00.3 Security Messages are generated when:
  - a. A user has 3 unsuccessful consecutive login attempts.
  - b. Local FBCB2 disable has been initiated by the user
  - c. Change in user access level had been initiated.
  - d. A user successfully re-authenticates at a remote FBCB2 for a remote user re-authentication request initiated by the SO.
  - e. A user fails to re-authenticate within the re-authentication time out period.
  - f. A lockout at a remote FBCB2 is initiated for a remote user lockout, initiated by the SO
  - g. A request for a remote FBCB2 disable, initiated by the SO, had been received at the remote FBCB2
  - h. A message has been rejected due to an invalid digital signature.
  - i. A digitally signed message has been rejected due to an invalid security date time group.
  - j. A digitally signed message has been rejected because the security address was not the receiving FBCB2 URN.
  - k. A digitally signed message has been rejected, in accordance with applicable JVMF Cases and Conditions.
8. Loss or damage of any FBCB2 component.
9. Loss or compromise of passwords

## **INDIVIDUAL SOLDIER RESPONSIBILITIES**

1. Use passwords as directed by SO or FBCB2 administrator.
2. Follow proper password, and log in and log off procedures and guidelines.
3. Use only prescribed keystrokes
4. Follow directions and options in FBCB2 error and warning notices.
5. Do not attempt to bypass security features or gain unauthorized access.
6. Log in ASAP at startup and after reconfiguration for accountability.
7. Do not leave FBCB2 unattended after log in.
8. Report suspected or actual security breaches to SO or FBCB2 administrator.
9. Emergency removal of FBCB2 components is IAW local SOP.
10. Disable FBCB2 and zeroize radios IAW local SOP if overrun or before capture.
11. Destroy FBCB2 and DTD/MDL IAW local SOP and TM 750-244-2.

## **END OF WORK PACKAGE**



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**OPERATOR MAINTENANCE  
DIGITAL OPERATORS GUIDE  
NSN , EIC**

**MILITARY OPERATIONS ON URBAN TERRAIN THEORY OF OPERATION**

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### **CHARACTERISTICS OF URBAN WARFARE**

Urbanization impacts on military operations by adding the element of urban sprawl to the existing terrain complex. It does not change basic tactical doctrine, but requires that commanders understand how these elements may affect the capabilities of their units, equipment, and weapons. Unlike deserts, forests, and jungles, which confront the commander with a limited variety of fairly uniform, recurring terrain features, the urban battlefield is composed of an ever-changing mix of natural and manmade features. Frequently, commanders of larger forces have units fighting on open terrain, on terrain within built-up areas, and on a complex where these two distinct terrain forms merge.

Urban sprawl expands the scope of the commander's terrain analysis and influences the organization and positioning of forces, weapons employment, and maneuver. The dominant role of armor and mechanized infantry on open terrain is balanced by the requirement to fight in the urban environment that favors the employment of infantry supported by other arms. Manmade features dispersed in varying densities provide increased cover and concealment while frequently restricting observation and fields of fire.

Fighting within a built-up area is characterized by a three-dimensional battle. In addition to fighting the enemy at street level, fighting may also be conducted on roofs, in upper stories of buildings, below street level in sewer systems, subways, and other underground structures. Assets and resources may be required to deny, retain, secure, or monitor each dimension.

In combination, the general characteristics of urban warfare make it more difficult to apply basic tactical fundamentals and maintain control. Military Operations on Urbanized Terrain (MOUT) requires detailed planning that provides for decentralized execution.

### **TERRAIN CONSIDERATIONS WITH FBCB2**

A detailed terrain analysis of the urban area and surrounding terrain is vital to the success of any operation in a Built Up Area (BUA) (see FM 34-130). Staff communications sections at every echelon must play an active role in this analysis. The need to communicate increases during MOUT, yet capabilities are often dramatically reduced due to the battlespace environment. Digitized units are faced with the difficult problems of preserving Tactical Internet integrity and connectivity to ensure continued flow of Situational Awareness (SA) and C2. Non-standard forms of communications such as aerial retrans platforms and smaller, 'hands-free' non-line of sight radios for dismounts can partially alleviate these problems, but digitized units may experience difficulty in maintaining connectivity and full functionality of their ABCS tools unless extraordinary steps are taken to assure communications.

Once operations have commenced there are indicators within the systems if operators are experiencing loss of digital communications. An indication is the FBCB2 System will be the fading (otherwise known as aging) of Friendly Situational Awareness. In the FBCB2 platform the operators can set the reporting time for own platform as well as aging filters for Situational Awareness against these own platform settings. For operations in BUA it is recommended that own position reporting time is every 2 minutes or 50 meters of movement. Further it is recommended that SA Aging Filters be set as follows:

1. Stale = 5 minutes
2. Old = 10 minutes.
3. Purge = 1 hour.

These settings enable operators to rapidly determine if in fact they are experiencing Line of Sight problems resulting in stale or old Friendly SA. The destruction or damage of the system also results in stale or old Friendly SA. Be careful of assuming if facts are not known as to why SA is going stale. The immediate action is, attempt to contact the stale platform with voice communication (FM or Wire, if employed) then notify higher headquarters via voice communications if this is in fact occurring. It is further recommended that prior to the onset of BUA operations that units have paper maps made available as well as all pertinent overlays and orders, so that transfer to analog operations is seamless and results in minimal confusion if loss of digital communications occurs.

Commanders must also take into consideration offensive operations as opposed to defensive operations when dictating filters settings. Commanders must keep in mind the likelihood of increased voice communication. When voice communication is ongoing, digital communications is halted on the net. Also, voice communication may still be possible even though digital



communication is degraded. In defensive operations more reliance on wire communication increases the performance of the digital net.

## COMMUNICATIONS

Urban features increase the difficulty of maintaining effective communications. Tactical radios, the backbone of command and control networks, are limited by range within built-up areas. Commanders must anticipate special challenges for all communications operations. Built-up areas distort radio waves, and the limited availability of uncongested lines of communication, make it difficult to move and install fixed station and multi-channel systems.

Frequency Modulated (FM) and Very High Frequency (VHF) radios that serve as the principal medium for command and control experience a reduction in effectiveness in built-up areas. The operating frequencies and power output of the sets demand a line-of-sight between antennas. Line-of-sight at street level is not always possible in built-up areas.

Amplitude Modulated (AM) High Frequency (HF) sets are less affected by the line-of-sight problem as operating frequencies are lower and power output is greater. HF radios are not organic to the small units that conduct the clearing operations. This can be overcome by retransmitting the FM and VHF signals.

SINGARS operates in the Very High Frequency (VHF) band and EPLRS in the Ultra High Frequency (UHF) band. The propagation characteristics of these frequency bands limit these radios to line of sight transmission. Additionally, these frequencies impose a physical limit on the bandwidth available to carry data.

Both SINGARS and EPLRS have been designed to provide an integral relay capability. SINGARS, when used with an Internet Controller Router, includes an intranet relay capability that extends data ranges. EPLRS provides up to five relays on Multi Source Group (MSG) needlines and up to three on Carrier Sense Multiple Access (CSMA) needlines. EPLRS relays must be participants on the respective needline, and capability to relay is limited by total radio capacity less that used by active needlines.

Retransmission stations in aerial platforms provide the most effective means if they are available. Most likely, organic retransmission sets have to be used. The antennas should be hidden or blend in with the surroundings so they won't be landmarks for the enemy to home in on. Water towers, existing civilian antennas, and steeples can conceal them.

Wire can be laid while friendly forces are in static positions, but careful planning is necessary. Messages, orders, and reports once passed over the landline can be transferred into FBCB2 to insure proper SA and C2 is maintained.

The seizure or retention of existing communications facilities must be included in planning. Every effort should be made to prevent damage or destruction of these facilities. If the local telephone system is already in place and tailored to the city or town, its use provides immediate access to wire communications with overhead and buried cable. This helps overcome the problems encountered with radios and provides a cable system less susceptible to combat damage.

## FIRE SUPPORT

The urban battlefield does not change the field artillery missions. Positioning is critical because of mobility restrictions, limited availability of suitable areas, masking of fires by urban features, security, and enemy counter battery fire. Within built-up areas, the direct fire role may take on added importance along with a more frequent use of the reinforcing mission. Field artillery and close air support, unless carefully coordinated, may actually prove counterproductive if collateral damage and rubble resulting from their employment impede subsequent maneuver. In addition, the requirement to preserve key facilities, such as civil communications, for future use must be considered. Consideration may be given to disseminating no fire areas to all platforms, or retaining the authority to call for fires at a higher level. Retransmission of digital signals must also be considered.

The characteristics of built-up areas require that special consideration be given to the establishment and maintenance of FA fire direction communication nets. The range capabilities of FM radios, which depend on line-of-sight, may be significantly reduced. Site selection for antennas is critical. The use of relay stations or retransmission devices is frequently required in order to maintain effective radio communication between Fire Integrated Support Teams (FIST) and fire direction centers. In many cases, forces have to depend on the use of field wire nets that are difficult to install and maintain.

## ENGINEER

During MOUT, Divisional engineers may be attached in order to support dispersed maneuver elements (e.g., one engineer company to each committed battalion, one platoon to each company, and a squad to each platoon). Frequently an engineer company of a corps combat engineer battalion assigned to the division reinforces a divisional combat engineer company. Proper and timely task organization is critical. The time factor for units outside the supported organization are longer and SOPs be unfamiliar to the supporting unit. For example, the new unit may not know of the requirement to conduct a digital radio check or



filter settings. If the supporting unit does not have FBCB2, Commanders may want to consider a command relationship rather than a support relationship.

**END OF WORK PACKAGE**







**CHAPTER 2**  
**OPERATOR MAINTENANCE**  
**MAINTENANCE INSTRUCTIONS**  
**FOR**  
**DIGITAL OPERATORS GUIDE**







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**CHAPTER 2**  
**OPERATOR MAINTENANCE**  
**MAINTENANCE INSTRUCTIONS**

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**WORK PACKAGE INDEX**

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<u>Title</u>	<u>WP Sequence No.</u>
Maintenance And System Support.....	0011 00







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**OPERATOR MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
**MAINTENANCE AND SYSTEM SUPPORT**

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**INITIAL SETUP:**

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**MAINTENANCE AND SYSTEM SUPPORT**

The FBCB2 maintenance concept is intended to mirror the Army Maintenance System. It is comprised of 4 levels: Operator, Unit, Direct Support/General Support and Depot. Users have multiple documents available to assist in maintaining and operating the AN/UYK-128 (V). These are:

1. AN/UYK-128 (V) 1 & (V) 2 User's Pocket Guide.
2. Unit Maintenance Manual.
3. Equipment Operators Manual.
4. System Administrators Manual.
5. Online SUM.

**PREVENTITIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

The purpose of PMCS is to discover and correct any deficiencies, faults, or defects. This ensures problems are resolved before serious equipment damage or failure occurs. Operators should conduct PMCS IAW TM 11-7010-326-10.

**MAINTENANCE TIPS**

Occasionally, FBCB2 does not transmit or receive data. Some common reasons for this are listed below:

**"Red" Status On Comms And Or Router.**

Usually the reason for this is a loss of power to the INC. Check the cable connection between the INC and the radio. Make sure the correct hard drive is installed.

**No Voice Or Data Capabilities.**

The SINCGARS radio must be within 3 seconds of the PLGR time for data or voice to pass. Remember, if there is no voice transmission, then there is no data transmission.

**SINCGARS Is Degraded.**

If SINCGARS is degraded, the user is probably on the wrong NET. Verify frequency with unit communications personnel.

**SA Problems.**

If the user can only see his icon, EPLRS is probably on the wrong RSID. Verify the RSID with unit communications personnel.

**SYSTEM CRASHES**

On rare occasions the system may crash. In most cases, the system automatically reboots itself without the loss of SA data or saved files. The same is true if the system locks up and the reset button is pushed. As a matter of SOP, verify that no data was lost (e.g. message address defaults, platform settings, filters, saved files, etc.).



## TROUBLESHOOTING PROCEDURES

The following describes troubleshooting procedures for the AN/UYK-128 (V) computer system.

### General.

Troubleshooting tasks help the equipment operator solve common problems and malfunctions. The troubleshooting tables list common malfunctions found while operating or servicing the AN/UYK-128 (V) computer. The troubleshooting tables in this manual have four columns; the first two identify a specific symptom. When experiencing malfunctions go to the troubleshooting tables. Identify the problem by following the test or inspection steps. Test or inspection is the first step to isolate the problem. Each test or inspection has listed a corrective action to apply. The operator performs each test or inspection and corrective action in the order listed. If the malfunction is not listed, or is not corrected by the corrective action, notify Unit Maintenance. Remember; record all uncorrected problems, faults, or malfunctions on DA Form 2404.

### Scope.

The purpose of limited troubleshooting is to isolate faults and to reduce the time the AN/UYK-128 (V) computer is non-operational. Isolating the problem to hardware or software helps to expedite the repair.

## OPERATORS TROUBLESHOOTING

### **WARNING**

Do not disconnect or connect any cables without first properly powering down the system and turning off all power. Where applicable, always disconnect the ground cable last when disassembling and always connect the ground cable first when assembling. Failure to comply may cause injury to personnel or equipment damage.

### **CAUTION**

If the Circuit Breaker switch does not stay in the [ON] position when closed, do not attempt to close it repeatedly. Closing the Circuit Breaker Switch repeatedly can create an overload situation causing equipment damage. Notify Unit Maintenance if the Circuit Breaker Switch does not stay in the [ON] position. Failure to comply with caution could result in equipment damage.

### **CAUTION**

Do not slave a vehicle (i.e., use a vehicle for a jump-start) without first powering down the AN/UYK-128 (V) computer systems on both vehicles. Failure to comply results in equipment damage.

**Table 1. Troubleshooting Index**

<b>EQUIPMENT AND/OR FUNCTION</b>	<b>FAULT INDICATION</b>	<b>CORRECTIVE ACTION</b>
No power to AN/UYK-128 (V) computer.	DU control and LED indicators are dark.	Press display <b>BLK OUT LAMP</b> , and press again if lights do not illuminate. If system remains dark refer to Table 8-2 Step b.
	DU red <b>PWR</b> LED is blinking.	Start Vehicle, and verify the green <b>PWR</b> LED is illuminated. If the green <b>PWR</b> LED is not illuminated, call Unit Maintenance.



Table 1. Troubleshooting Index–Continued

EQUIPMENT AND/OR FUNCTION	FAULT INDICATION	CORRECTIVE ACTION
AN/UYK-128 (V) computer is operating on PU battery power.	DU red <b>PWR</b> LED is illuminated indicating PU is operating on internal battery power.  <b>NOTE</b> To save your data, perform the proper shutdown.	Verify that the power cable is properly connected to <b>J1 PWR</b> on <b>PU</b> . If <b>PWR</b> LED remains illuminated red, then call Unit Maintenance.
AN/UYK-128 (V) computer fails to switch to back-up power with loss of vehicle power.	DU red <b>PWR</b> LED is not illuminated indicating PU is not operating on internal battery power.	Refer to Table 8-2, No.4.
DU of AN/UYK-128 (V) computer indicates loss of both Date/Time Group (DTG) and platform location.	The GPS status gumball is coded as R (i.e., red).NoteEnsure that nothing is directly blocking the PLGR antenna.	Refer to Table 8-3.
Message data not transmitted or received.	Comm Status gumball is A (i.e., amber) or R (i.e., red) and/or Icons are stale).  <b>NOTE</b> Ensure that system has had enough time to enter the network.	Refer to Table 8-3, No.1.
SINGARS radio problems.	SINGARS radio status is <b>Degraded</b> , not receiving SA data, or not receiving C2 messages.  <b>NOTE</b> Applies only to those platforms equipped with the SINGARS ASIP radio.	Refer to Table 84, No.2.
	SINGARS radio status is No Go, nor receiving SA data, or not receiving C2 messages.  <b>NOTE</b> Applies only to those platforms equipped with the SINGARS ASIP radio.	Refer to Table 84, No. 3.



Table 1. Troubleshooting Index--Continued

EQUIPMENT AND/OR FUNCTION	FAULT INDICATION	CORRECTIVE ACTION
EPLRS radio problems.	EPLRS status is <b>No Go</b> , not receiving SA data, or not receiving C2 messages.	<b>NOTE</b> Ensure that the EPLRS radio has had enough time to enter the radio network.
	LCNs indicate <b>No Go</b> or <b>Not Tested</b> .  <b>NOTE</b> Applies only to those platforms equipped with the EPLRS radio.	Refer to Table 84, No. 4.
<b>CPU</b> LED indicators on DU.	Green LED is illuminated.Amber LED is illuminated.  <b>NOTE</b> Indicates degraded PU speed due to elevated temperature, but the PU is operating.  Red LED is illuminated.  <b>NOTE</b> Indicates a shutdown or failure of the PU due to elevated temperature.	Operation is normal. <b>CPU</b> ambient temperature is increasing.Verify that PU cooling fins are clean and not blocked or obstructed in any way. Refer to Table 8.5 , No. 1 Step a  <b>NOTE</b> PU NSN 7021-01-475-0217 does not have cooling fins, but surfaces must remain clear to radiate heat.  Shutdown the AN/UYK-128 (V) computer system immediately.Refer to Table 8.5 , No. 2 Step a.
<b>DISP</b> LED indicators on DU.	Green LED is illuminated.Amber LED is illuminated.  <b>NOTE</b> Indicates degraded PU speed due to elevated temperature, but the PU is operating.  Red LED is illuminated.  <b>NOTE</b> Indicates a shutdown or failure of the PU due to elevated temperature.	Operation is normal. <b>DU</b> ambient temperature is increasing.Verify that PU cooling fins are clean and not blocked or obstructed in any way. Refer to Table 86, No. 1 Step a.  <b>NOTE</b> PU NSN 7021-01-475-0217 does not have cooling fins, but surfaces must remain clear to radiate heat.  Shutdown the AN/UYK-128 (V) computer system immediately.Refer to Table 86, No. 2 Step a.



Table 1. Troubleshooting Index–Continued

EQUIPMENT AND/OR FUNCTION	FAULT INDICATION	CORRECTIVE ACTION
Display Unit LEDs and/or screen not illuminated	LEDs dark and/or screen is black. Display Unit screen is dark but LEDs are illuminated. Display Unit touchscreen not functioning.	Press <b>BLK OUT LAMP</b> button to verify that the screen is not in blackout mode. If not, refer to Table 86, No. 1. Touch the DU screen to verify that it is not in screen saver mode. If not, call Unit Maintenance. Perform touchscreen calibration. If problem not solved, call Unit Maintenance.
KU keys and/or mouse incorrect operation.	KU keys nor the mouse operate correctly. Single keys(s) do not operate. Missing or damaged keys.	Check cable connection from KU to DU, and hand tighten if necessary. Reboot AN/UYK-128 (V) computer. If problem still exists, call Unit Maintenance. Select any text screen and try several keys, and call Unit Maintenance if keys do not operate. Call Unit Maintenance.
The AN/UYK-128 (V) computer system fails to boot-up.	DU screen displays the following message: <b>INIT: Command is respawning too rapidly. Check for possible errors.</b> Computer fails to boot-up to Session Manager screen. Computer continuously reboots/locks up, indicating a possible PU fault.	Refer to Table 8.9.9 No. 1 Step a. Reboot the system. If computer does not boot to Session Manager screen, call Unit Maintenance. Reboot computer according to established orderly procedures, but if unsuccessful refer to Table 8.9.9, No. 3 Step a.
Internet Controller (INC).	Router file (F5 Status) indicates PPP NO GO.	Perform the clear INC procedure according to Table 8. 9  <b>NOTE</b>  It may be necessary to repeat the procedure three or four times to clear the INC.  Problem solved. If not, refer to Table 84, No. 1 Step b.



Table 2. Power Troubleshooting

No.	Symptom	Test or Inspection	Corrective Action
1	No power to AN/UYK-128 (V) computer.(DU control and LED indicators are dark.)	a. Press display <b>BLK OUT LAMP</b> , press again if lights do not come on (i.e., do not illuminate). b. Press display <b>FCN</b> and <b>BRT+</b> buttons several times. c. Press DU <b>PWR</b> button for up to 4 seconds. d. Verify W1 and W2 cables are properly connected. e. Reset PU circuit breaker / switch. f. Press the DU <b>PWR</b> button for up to 4 seconds. g. Check for specific platform(s): (if your platform is not listed, proceed with step h.) g1. M1068/M113M934/M1097 check SINGGARS ASIP for power. g2 Tracked Vehicles. Verify MCS System switch is set to one of the three program settings. g3 Paladin – Verify Master Power switch is set to the ON position. h. Start vehicle. Repeat Steps a through g above.	a1 System lights up - problem solved a2 System remains dark - continue with next step b1 LEDs light up - problem solved b2 LEDs remains dark - continue with next step. c.1 System lights up - problem solved. c.2 System remains dark - continue next step. d. Continue next step. e. Continue next step. f.1 If the green <b>PWR</b> LED lights up - problem solved. f.2 System remains dark - continue next step. g.1 Retry pressing AN/UYK-128 (V) DU <b>PWR</b> button for up to 4 seconds (or until the green LED is illuminated). Green <b>PWR</b> LED lights up - problem solved. If not, proceed to Step h. g.2 Retry pressing AN/UYK-128 (V) DU <b>PWR</b> button for up to 4 seconds (or until the green LED is illuminated). Green <b>PWR</b> LED lights up - problem solved. If not, proceed to Step h. g.3 Retry pressing AN/UYK-128 (V) DU <b>PWR</b> button for up to 4 seconds. If the green <b>PWR</b> LED lights up, problem solved. If not, proceed to Step h. h. If the green <b>PWR</b> LED lights up, problem solved. If not, call Unit Maintenance.
2	AN/UYK-128 (V) computer is operating on PU battery power.  <b>NOTE</b>  DU red <b>PWR</b> LED is illuminated indicating PU is operating on internal battery power. To save your data, perform the proper shutdown.	a. Verify that power cable connected to J1 PWR on PU b. Verify vehicle does not have a power problem c. Set SINGGARS VAA Power CB1 switch to ON and the RS function switch to STBY or ON. d. Verify that vehicle switches / circuit breakers are set to ON.	a.1 Yes - continue with next step. No - call Unit Maintenance. b.1 Vehicle power shows amber. Start vehicle – problem solved. If not, continue. b.2 SINGGARS ASIP radio has power – call Unit Maintenance. If not, continue with Step c. c.1 SINGGARS ASIP RT display lights – call Unit Maintenance. c.2 SINGGARS ASIP radio system has no power – continue. with next step. d.1 Vehicle switches / circuit breakers are set OFF - set them ON – repeat Step 2c. d.2 Vehicle switches / circuit breakers are set ON – call vehicle maintenance.



**Table 2. Power Troubleshooting—Continued**

<b>No.</b>	<b>Symptom</b>	<b>Test or Inspection</b>	<b>Corrective Action</b>
3	DU red <b>PWR</b> LED is blinking.	Start vehicle.	If the green <b>PWR</b> LED lights up, problem solved. If not, call Unit Maintenance.
4	AN/UYK-128 (V) computer fails to switch to back-up power with loss of vehicle power.	Open PU access door and verify battery status on battery tray/battery box.  <b>NOTE</b> For PU NSN 7025-01-474-3793, press the diagnostic button on front of battery tray twice.	Charge battery, problem solved. If not, call Unit Maintenance for the following conditions: PU NSN 7025-01-474-3793, code 05 is displayed. PU NSN 7025-01-475-0217, less than three LCD bars displayed.

**NOTE**

Before proceeding with the steps in Table 3, check to ensure that nothing is directly blocking the PLGR antenna. Remember that PLGR reception is Line-Of-Sight (LOS). If LOS is blocked by buildings, trees, or elevated terrain reposition to a better location.

**Table 3. Loss Of Date/Time Troubleshooting**

<b>No.</b>	<b>Symptom</b>	<b>Test or Inspection</b>	<b>Corrective Action</b>
1	DU of AN/UYK-128 (V) computer indicates loss of both Date/Time Group (DTG) and platform location. The GPS status gumball is coded as R (i.e.red).	a. Select <b>F5 Status...</b> button on the Ops Main Screen.	a. Open <b>GPS</b> folder and check <b>Time</b> , <b>Position</b> , and <b>Heading</b> status. If any one of the three display a <b>Go</b> status, proceed to Step c. If all are <b>No Go</b> status, proceed to Step b



Table 3. Loss Of Date/Time Troubleshooting--Continued

No.	Symptom	Test or Inspection	Corrective Action
2		b. PLGR indicates correct DTG and location.	b.1 Shutdown AN/UYK-128 (V) computer and set circuit breaker/switch to OFF. b.2 b.3 b.4 b.5 b.6b.7b.8 b.9 b.2 Ensure PLGR has an almanac age of at least 3 days, a TFOM of 5 or less, and a FOM of 4 or less. If not, proceed to step c. If correct, continue. b.3 Shutdown PLGR. b.4 Check W3P serial interface connection to PLGR J2. If loose, hand tighten cable. b.5 Check remote PLGR antenna cable connection to antenna. If loose, tighten cable. b.6 Startup the PLGR. b.7 Set circuit breaker/switch to ON and startup AN/UYK-128 (V) computer. b.8 After startup, AN/UYK-128 (V) computer indicates time/location – problem resolved. b.9 After startup, AN/UYK-128 (V) computer does not indicate time/location – call Unit Maintenance.
3	<p><b>WARNING</b></p> <p>PLGR battery may leak or explode if it remains inside PLGR when the external power cable is connected. Remove battery prior to reconnecting power cable. Failure to comply may result in injury to personnel or damage to equipment.</p>	c. PLGR does not indicate correct DTG and location.	c.1 Ensure PLGR is setup properly (e.g., Setup mode: CONT, SV-TYPE; ALL-Y, SETUP UNITS L/LDMS). If not, apply correct settings – problem solved. If not, continue with next step. <b>Caution</b> Do not connect or disconnect any cables with the PLGR or the Processor Unit (PU) turned on. Failure to comply may result in equipment damage c.2 Shutdown AN/UYK-128 (V) computer and set circuit breaker/switch to OFF. c.3 Shutdown PLGR. c.4 Remove PLGR from its mount. c.5 Disconnect power cable, antenna cable, and serial data cable from PLGR. c.6 Install battery in PLGR (see WARNING). c.7 Position PLGR outside of platform. c.8 If PLGR indicates correct DTG and location, then problem with platform antenna or antenna cable – call Unit Maintenance. c.9 If PLGR does not indicate correct DTG and location, then problem is with PLGR - call Unit Maintenance. c.10 Remove battery from inside of PLGR and reinstall PLGR back on its mount (see WARNING).



**NOTE**

Before proceeding with the steps in Table 4, check to ensure that nothing is directly blocking the EPLRS or SINCGARS antennas. Remember that both EPLRS and SINCGARS ASIP reception are Line-Of-Sight (LOS). If your vehicle is positioned where LOS is blocked by buildings, trees, or elevated terrain, your platform may need move to a better location.

**NOTE**

The Comm Status gumball may be coded as A (i.e., amber) if you are the only one in the net. If your Unit/Role is generic or incorrect, the Comm Status gumball may be coded as G (i.e., green) and you will not receive your own Command and Control (C2) messages.

**Table 4. Loss of Connectivity Troubleshooting**

<b>No.</b>	<b>Symptom</b>	<b>Test or Inspection</b>	<b>Corrective Action</b>
1	<p>Message data not transmitted or received. Comm Status gumball is A (i.e., amber) or R (i.e., red) and/or Icons are stale).</p> <p><b>NOTE</b></p> <p>Ensure that system has had enough time to enter the network.</p>	<p>a. Select the <b>F5 Status...</b> button on the Ops Main Screen.</p> <p>b. Router file indicates PPP status of <b>No Go</b></p> <p><b>NOTE</b></p> <p>Stepb is used to check the Internet Controller (INC).</p>	<p>a.1 Open <b>Local Comm</b> folder and check router status. If router status shows <b>Degraded</b> or <b>No Go</b>, open router folder.</p> <p>a.2 Proceed to Step b if PPP is <b>No Go</b>. Proceed to Step 2 if SINCGARS status is <b>Degraded</b></p> <p>.a.3 Proceed to step 3 if SINCGARS status is <b>No Go</b>. Proceed to Step 4 if EPLRS status is <b>No Go</b></p> <p>.b.1 Open Router file and verify PPP status. If PPP status is <b>No Go</b>, proceed to b.2. If PPP status is <b>Go</b>, proceed to Step 2.</p> <p>b.2 Verify W3 is properly connected to J6 connector on the INC. If properly connected, continue with b.3. If not, shutdown INC and AN/UYK-128 (V) computer. Reboot INC and AN/UYK-128 (V) computer. Wait 2 to 3 minutes - problem solved. If not, continue with b.3</p> <p>.b.3 Perform procedure to clear INC (refer to Table 8). Problem solved. If not, call Unit Maintenance.</p>



Table 4. Loss of Connectivity Troubleshooting--Continued

No.	Symptom	Test or Inspection	Corrective Action
2	<p>SINCGARS radio status is <b>Degraded</b> or not receiving SA data or C2 messages.</p> <p><b>NOTE</b> Applies only to those platforms equipped with the SINCGARS ASIP radio.</p>	<p>a. Expand the SINCGARS file to show Interface, Net ID/Frequency and Packet mode status.</p> <p>b. SINCGARS file Interface status is <b>Degraded</b>.</p> <p>c. SINCGARS file Net ID/Frequency status is <b>Degraded</b>. SINCGARS Packet file status is <b>Degraded</b>.</p> <p>e. Check COMSEC load.</p> <p>f. Check radio(s) antenna(s) for damage and placement. (Antennas should not be stowed, or tied down.)</p>	<p>a. Proceed to Step b for Interface <b>Degraded</b> status, Step c for Net ID/ Frequency <b>No Go</b> status, and Step d for Packet mode <b>No Go</b> status. If all indicate <b>Go</b>, proceed to Step e below.</p> <p>b.1 Ensure the SINCGARS ASIP is in channel one. Check W4 to ensure that cable is properly connected to the corresponding connector (i.e., R/T Radio A to Data A connector on INC). If not, correct and verify status – problem solved.</p> <p>b.2 Check Julian date/time and frequency settings of R/T radio. If incorrect, set correct date/time and frequency and verify status – problem solved.</p> <p>b.3 Perform voice check. If unable to communicate, proceed to step f.</p> <p>b.4 If Julian date/time and frequency correct, call Unit Maintenance.</p> <p>c. Check Admin/Local Settings to ensure hopset matches hopset on SINCGARS ASIP.</p> <p>d.1 Check SINCGARS ASIP setup (e.g., chan 1, Cipher Text (CT), frequency hop, Packet Mode (PCKT), frequency). If not properly setup, apply correct settings and verify status–problem solved.</p> <p>d.2 R/T radio setup properly, proceed.</p> <p>e.1 If a fill is needed, load COMSEC Crypto per SINCGARS TM.</p> <p>e.2 If COMSEC load is good, proceed to Step f.</p> <p>f.1 Untie antenna(s) and recheck system for data transmit/receive capability. If OK, problem solved.</p> <p>f.2 Antenna(s) damaged or up and in good condition. - Call Unit Maintenance and report conditions.</p>



Table 4. Loss of Connectivity Troubleshooting--Continued

No.	Symptom	Test or Inspection	Corrective Action
3	<p>SINGARS radio status is <b>No Go</b>.</p> <p><b>NOTE</b></p> <p>Applies only to those platforms equipped with the SINGARS ASIP radio.</p>	<p>a. Expand the SINGARS file to show Interface, Net ID/Frequency and Packet mode status.</p> <p>b. SINGARS file Interface status is <b>No Go</b>.</p> <p>c. SINGARS file Net ID/Frequency status is <b>No Go</b>.</p> <p>d. SINGARS Packet file status is <b>No Go</b>.</p> <p>e. Check COMSEC load.</p> <p>f. Check radio(s) antenna(s) for damage and placement. (Antennas should not be stowed, or tied down.)</p>	<p>a. Proceed to Step b for Interface <b>No Go</b> status, Step c for Net ID/ Frequency <b>No Go</b> status, and Step d for Packet mode <b>No Go</b> status. If all indicate <b>Go</b>, proceed to Step e below.</p> <p>b.1 Check W4 to ensure cable is properly connected to corresponding connector.</p> <p>b.2 Check Admin/Local Settings to ensure the correct radio set up (i.e., FBCB2 System displays either Radio A or Radio B).</p> <p>b.3 Ensure the SINGARS radio is in packet mode.</p> <p>b.4 Check Julian date/time and frequency settings of R/T radio. If incorrect, set correct date/time and frequency and verify status – problem solved</p> <p>b.5 If Julian date/time and frequency correct, call Unit Maintenance.</p> <p>c. Check Admin/Local settings to ensure hopset matched hopset on SINGARS ASIP.</p> <p>d.1 Check SINGARS ASIP setup (e.g., chan 1, Cipher Text (CT), frequency hop, Packet Mode (PCKT), frequency). If not properly setup, apply correct settings and verify status– problem solved.</p> <p>d.2 R/T radio setup properly, proceed.</p> <p>e.1 If a fill is needed, load COMSEC Crypto per SINGARS TM.</p> <p>e.2 If COMSEC is good, proceed to Step f.</p> <p>f.1 Untie antenna(s) and recheck system for data transmit/ receive capability. If OK, problem solved.</p> <p>f.2 Antenna(s) damaged or up and in good condition. - Call Unit Maintenance.</p>
4	<p>EPLRS status is <b>No Go</b> or not receiving SA data or C2 messages.</p> <p><b>NOTE</b></p> <p>Applies only to those platforms equipped with EPLRS radio.</p>	<p>a. EPLRS status LCNs indicate <b>NO Go</b> or <b>Not Tested</b></p> <p><b>NOTE</b></p> <p>Ensure that EPLRS has had enough time to enter the radio network.</p>	<p>a.1 EPLRS <b>Alarm</b> light and <b>OUT OF NET</b> light illuminated. Check to ensure COMSEC is keyed. If not, call Unit Maintenance.</p> <p>a.2 EPLRS <b>OUT OF NET</b> light blinks once every second (i.e., cannot find network), Check to ensure antenna is connected. Check to ensure that COMSEC is keyed. Perform test with URO to verify that an @S (or an @C) is returned. If @0 displayed, call Unit Maint.</p> <p>a.3 EPLRS <b>OUT OF NET</b> light blinks once every 4 seconds (i.e., unit is caught in track net), recycle EPLRS power. If blinking light stops, problem solved. If not, call Unit Maint.</p> <p>a.4 Use the URO to verify status of EPLRS. If unable to fix, call Unit Maintenance.</p>

**NOTE**

The green CPU Light Emitting Diode (LED) will normally be illuminated. If the amber CPU LED turns on, the PU ambient temperature is increasing. Processing speed of PU will automatically slowdown to reduce heat. If the red CPU LED turns on, shut down the AN/UYK-128 (V) computer system immediately. LED indicators should be monitored regularly.



Table 5. Processor Unit Temperature Troubleshooting

No	Symptom	Test or Inspection	Corrective Action
1	The CPU amber LED on the DU is illuminated, indicating degraded PU speed due to elevated temperature, but the PU is operating.	<p>Verify that PU cooling fins are clean and not blocked or obstructed in any way.</p> <p><b>NOTE</b></p> <p>PU NSN 7021-01-475-0217 does not have cooling fins, but surfaces must remain clear to radiate heat.</p>	<p>a.1 Perform software shutdown, then press the DU <b>PWR</b> button, until green <b>PWR</b> LED goes dark.</p> <p>a.2 Allow a minimum of 5 minutes for cooling. Clear cooling fins (all sides and top)</p> <p>a.3 Press DU <b>PWR</b> button for up to 4 seconds and release when <b>PWR</b> green LED is illuminated.</p> <p>a.4 After 5 minutes of operation, the <b>CPU</b> LED light remains green. Problem solved.</p> <p>a.5 After 5 minutes of operation, the amber light is again illuminated. - Call Unit Maintenance.</p>
2	The <b>CPU</b> red LED on DU is illuminated, indicating a shutdown or failure of the PU due to elevated temperature.	<p>a. Check PU cooling fins to verify that PU cooling fins are clean and not blocked or obstructed.</p>	<p>a.1 Perform software shutdown, then press the DU panel <b>PWR</b> button, until green <b>PWR</b> LED goes dark.</p> <p>a.2 Allow a minimum of 20 minutes for proper cooling. Clear cooling fins (all sides and top).</p> <p>a.3 Press DU <b>PWR</b> button for up to 4 and release when <b>PWR</b> green LED is illuminated.</p> <p>a.4 After 5 minutes, the <b>CPU</b> LED light remains green. Problem solved.</p> <p>a.5 The <b>CPU</b> LED red light is again illuminated. Shutdown the AN/UYK-128 (V) computer system immediately. Call Unit Maintenance.</p>

**NOTE**

The green DISP Light Emitting Diode (LED) is normally illuminated. If the amber DISP LED turns on, DU temperature is increasing. Screen brightness automatically decreases to reduce heat. If the red DISP LED turns on, shut down the AN/UYK-128 (V) computer immediately. Monitor LED indicators regularly.



Table 6. Display Unit Temperature Troubleshooting

NO.	SYMPTOM	TEST OR INSPECTION	CORRECTIVE ACTION
1	The <b>DISP</b> amber LED on the DU is illuminated, indicating decreased brightness because of elevated temperature.	<p>Check DU cooling fins. Verify that DU cooling fins are clean and not blocked in any way.</p> <p><b>NOTE</b></p> <p>PU NSN 7021-01-475-0217 does not have cooling fins, but surfaces must remain clear to radiate heat.</p>	<p>a. Perform software shutdown. Press DU <b>PWR</b> button until green <b>PWR</b> LED goes dark.</p> <p>b. Allow 5 minutes for cooling (out of direct sunlight). Clear cooling fins (all sides and top)</p> <p>c. Press DU <b>PWR</b> button for up to 4 seconds and release when <b>PWR</b> green LED is illuminated.</p> <p>d. After 5 minutes of operation, green <b>DISP</b> LED remains illuminated. – Problem solved.</p> <p>e. After 5 minutes of operation, amber LED is again illuminated. – Call Unit Maintenance.</p>
2	The red <b>DISP</b> LED on DU is illuminated, indicating DU shutdown or failure.	<p>Check DU cooling fins. Verify that the DU cooling fins are clean and not blocked or obstructed.</p> <p><b>NOTE</b></p> <p>PU NSN 7021-01-475-0217 does not have cooling fins, but surfaces must remain clear to radiate heat.</p>	<p>a. Perform software shutdown. Press DU <b>PWR</b> button until green <b>PWR</b> LED goes dark.</p> <p>b. Allow 20 minutes for cooling (out of direct sunlight). Clear cooling fins (sides, top, and rear).</p> <p>c. Press DU <b>PWR</b> button for up to 4 seconds and release when <b>PWR</b> green LED is illuminated.</p> <p>d. After 5 minutes of operation, the green <b>DISP</b> LED remains illuminated. – Problem solved.</p> <p>e. Red <b>DISP</b> LED is again illuminated. – Shutdown the AN/UYK-128 (V). Call Unit Maintenance.</p>

Table 7. Display Unit Troubleshooting

No.	Symptom	Test or Inspection	Corrective Action
1	Display Unit LEDs and/or screen not illuminated (LEDs dark and/or screen is black).	Press <b>BLK OUT LAMP</b> button to verify that the screen is not in blackout mode.	<p>a. Display Unit LEDs and screen illuminate – problem solved. If not, continue.</p> <p>b. Press Display Unit <b>BRT +</b> button and <b>FCN plus LED +</b> button(s) (4 times) each to make sure brightness is not turned down – problem solved. If not, continue.</p> <p>c. Press Display Unit <b>PWR</b> button for up to 4 seconds (ensure circuit breaker/switch is set to ON). LEDs and screen light up – problem solved. If not, call Unit Maintenance.</p>
2	Display Unit screen is dark (but LEDs are illuminated)	Touch the DU screen to verify that it is not in screen saver mode.	Screen illuminates - problem solved. If not, call Unit Maintenance.
3	Display Unit touchscreen not functioning.	Perform touchscreen calibration.	Touchscreen functions properly – problem solved. If not, call Unit Maintenance.



Table 8. Keyboard Unit Troubleshooting

No.	Symptom	Test or Inspection	Corrective Action
1	Single key(s) do not operate.	Select any text screen and try several keys.	Call Unit Maintenance and report which key(s) do not operate.
2	None of the KU keys, nor the mouse operates correctly.	a. Check cable connection from KU to DU. b. Perform software shutdown. Press DU <b>PWR</b> button for up to 4 seconds and release after the green PWR LED light goes dark. Wait 20 seconds. Press DU <b>PWR</b> button for up to 4 seconds (or until the green LED is illuminated) to reboot computer.	a. If connection is loose, hand tighten and proceed to Step b. If connection seems tight, proceed to Step b. b.1 KU keys and mouse now functions correctly - problem solved. b.2 KU keys and mouse still do not function correctly - call Unit Maintenance.
3		KU has missing or damaged keys.	Call Unit Maintenance.

Table 9. Processor Unit - Bootup Troubleshooting

No.	Symptom	Test or Inspection	Corrective Action
1	System fails to boot-up and DU screen displays the following message: <b>INIT: Command is respawning too rapidly. Check for possible errors.</b>	None	a. Press DU <b>PWR</b> button for up to 4 seconds until the green LED goes dark to shut down the AN/UYK-128 (V) computer. Set PU circuit breaker/switch to OFF. b. Verify the Keyboard Unit cable is properly connected. If properly connected, call Unit Maintenance. c. Set PU circuit breaker/switch to ON. Press DU <b>PWR</b> button for up to 4 seconds (or until green LED is illuminated), then release to restart the AN/UYK-128 (V) computer. d. The AN/UYK-128 (V) computer functions correctly – problem is solved. If not, call Unit Maintenance.
2	The AN/UYK-128 (V) computer fails to boot-up to Session Manager screen	None	Reboot the system. Computer boots to Session Manager screen - problem solved. If not, call Unit Maintenance.
3	The AN/UYK-128 (V) computer continuously reboots/locks up, indicating a possible PU fault.	Operator followed established orderly procedures for rebooting the computer. The system still fails to reboot.	a. Press DU <b>PWR</b> button for up to 4 seconds until the green LED goes dark to shut down the AN/UYK-128 (V) computer. b. Wait 20 seconds. Press DU <b>PWR</b> button for up to 4 seconds (or until green LED is illuminated), then release to restart the AN/UYK-128 (V) computer. c. At the Session Manager screen, "Clear Logs and Queues" per the procedures listed in Table 2–15. d. The AN/UYK-128 (V) functions correctly - problem is resolved. e. The AN/UYK-128 (V) still does not function properly - call Unit Maintenance.

**NOTE**

It may be necessary to repeat the procedures in Table 10 three or four times to clear the Internet Controller.



Table 10. Clear INC (SINGARS ASIP Radio)

NO.	Operator Action	Indication Or Condition
1	Rotate SINGARS ASIP R/T radio function (FCTN) switch to <b>LD</b> position.	R/T on SINGARS ASIP radio has <b>FCTN</b> switch position set to <b>LD</b> .
2	Press the <b>2</b> button.	Radio displays: <b>RT</b>
3	Press the <b>7</b> button until radio display <b>LDE</b> .	Radio displays: <b>LDE</b> Then after 1–2 seconds, radio displays: <b>LDE-N</b>  <b>NOTE</b> If the Receiver/Transmitter (R/T) displays <b>NEWIP</b> after <b>LDE-N</b> , press <b>STO</b> button.
4	Press the <b>1</b> button.	Radio displays: <b>1</b>
5	Press the <b>STO</b> button.	Radio displays: <b>DEFLT</b> Then after 1–2 seconds <b>RT</b>
6	Rotate radio function switch to ON position.	R/T on SINGARS ASIP radio has <b>FCTN</b> switch position set to <b>ON</b> position.
7	Reboot the AN/UYK-128 (V) computer system.	Communication status gumball is G (i.e., green), problem solved. If Communication status gumball is R (i.e., red) or A (i.e., amber), call Unit Maintenance.

END OF WORK PACKAGE







**CHAPTER 3**  
**OPERATOR MAINTENANCE**  
**SUPPORTING INFORMATION**  
**FOR**  
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**CHAPTER 3**  
**OPERATOR MAINTENANCE**  
**SUPPORTING INFORMATION**

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**WORK PACKAGE INDEX**

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**OPERATOR MAINTENANCE**  
**DIGITAL OPERATORS GUIDE**  
**NSN NA, EIC NA**

**REFERENCES**

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**Scope**

This work package lists the forms, technical bulletins, technical manuals and miscellaneous publications referenced in this manual.

Appendices Scope Section

**FORMS**

DA Form 2404	Equipment Inspection and Maintenance Worksheet
DA Form 5988E	Automated Equipment Inspection and Maintenance Worksheet
DA Form 2407	Maintenance Request
DA Form 2028	Recommended Changes to Publications
SF 368	Product Quality Deficiency Report

**TECHNICAL MANUALS**

FM 71-1	Tank and Mechanized Infantry Battalion Task Force.
FSKM 71-1	Platoon and Company Digital Operations ,Digital Supplement.
FSKM 71-2	The Armored and Mechanized Infantry Battalion Task Force.
FSKM 71-3	The Armored and Mechanized Infantry Brigade.
FSKM 17-97-10	The Brigade Reconnaissance Troop.
TM 11-5820-890-10	SINGARS ASIP
TM 11-5825-283-10	Enhanced Position Location Reporting System
TM 11-5825-291-13	Satellite Signals Navigation Set AN/PSN-11
TM 11-5820-1130-12&P	Radio Set AN/PSC-5 (MILSATCOM)

**END OF WORK PACKAGE**







**OPERATOR MAINTENANCE  
DIGITAL OPERATOR'S GUIDE  
NSN NA, EIC NA**

**APPENDIX A: MESSAGE DEFAULT ADDRESSEES AND ACCESS LEVELS**

FBCB2 uses the system's role to determine the appropriate level of access to messages or the SA edit function. An example of this is that as users have access to the Spot Report, but only users with access Level 3 or 4 have access to the Threat Warning Report.

Listed below are the categories associated with all FBCB2 messages and applications:

1. Level 1 – Platform/Wingman/ Squad Leader.
2. Level 2 – Platoon Leadership.
3. Level 3 – Company/Battery/Troop Leadership.
4. Level 4 – Battalion/Squadron/Brigade/Regiment Leadership and Staff.

There are exceptions to the above categories. These exception roles fall under level 4 for access purposes:

1. Scout Platoons.
2. Reconnaissance Troops.
3. Company Level TOCs.
4. Military Police Platoons.
5. Aircraft.
6. Strikers.

Table 1 below lists the SA access levels:

**Table 1. Message Default Addressees And Access Levels**

MESSAGE TYPE	USE	FBCB2 DEFAULT ADDRESSEES	SA	ACCESS LEVEL
Spot/Salt	Observation of Enemy	S2 TOC ASAS	Y	1,2,3,4
NBC 1	Initial Observation of NBC Event	BN S3	Y	1,2,3,4
Check Fire	Stop Indirect Fire Missions	#1. Specific Mission: Firing Battery FDC #2. All Missions: 1st Artillery system in sender's organization	N	1,2,3,4
Call For Fire	Request, Coordinate, Assign Indirect Fire	1st Artillery System in Sender's Organization	N	1,2,3,4
On Call Fire Command	"At my Command" Indirect Fire Mission	1st Artillery System in Sender's Organization	N	1,2,3,4
End Of Mission	Terminate Ongoing Call for Fire Mission. Normally Initiated by the Observer or Originator of the Fire Mission.	Firing Battery FDC that is Providing Fires	N	1,2,3,4
Subsequent Adjust	Adjust Artillery Fires. Only Initiated by the Observer or Originator of the Fire Mission.	Firing Battery FDC that is Providing Fires	N	1,2,3,4
Observer Readiness Report	Location and Readiness of a Designated Observer	1st Artillery System in Sender's Organization	N	1,2,3,4
Obstacle Report	Report Obstacles and Minefields Encountered on the Battlefield	Battalion/Brigade S3 OPS Section MCS	Y	1,2,3,4



**Table 1. Message Default Addressees And Access Levels–Continued**

<b>MESSAGE TYPE</b>	<b>USE</b>	<b>FBCB2 DEFAULT ADDRESSEES</b>	<b>SA</b>	<b>ACCESS LEVEL</b>
Bridge Report	Location, description, and condition of bridges	Battalion/Brigade S3 OPS section MCS	Y	1,2,3,4
Supply Point Status Report	Report Supply Point Locations, Operating Times, Stocked Items, and Quantities	None	Y	1,2,3,4
Threat Warning	Imminent Enemy Ballistic Missile, Aircraft, or NBC Attack	None	Y	3,4
STRIKE Warning	Warn Friendly Forces of Planned Friendly Conventional or Nuclear Bursts	None	Y	3,4
SITREP	Report a Platform or Unit's Tactical/Logistical Situation	None	N	1,2,3,4
CTIL/BRIL	Identify List of Equipment Commander has Identified as Reportable	None	N	2,3,4
NBC 3 Report	Predicts Downwind Hazard Areas.	None	N	1,2,3,4
NBC 4 Report	Report results of NBC monitoring, survey, or reconnaissance mission	None	N	1,2,3,4
Chemical Downwind Report	Transmit Weather Data effects on NBC Operations and Hazardous Area Prediction, Used by Smoke Generation Units	None	N	3,4
Effective Downwind Report	Transmit Weather Data effects on NBC Operations and Hazardous Area Prediction	None	N	3,4
MOPP	Announce and Disseminate MOPP Level	None	N	1,2,3,4
MEDEVAC	Request for Medical Evacuation	None	N	1,2,3,4
Message to Observer	Initiated in AFATDS. Sent Directly to platform initiating a call for fire	None	N	1,2,3,4
Fire Support Coordination Measure	Define, Modify, or Delete Fire Support Coordination Measures. Maneuver Leaders use this Message to Provide input to Indirect Fire Planning Process.	None	N	1,2,3,4
Position Report	Report Friendly Unit Location Data	None	Y	1,2,3,4
REDCON	#1. Top-down to direct specific readiness state. #2. Bottom-up to report status	None	N	1,2,3,4
Field Orders	Operation Order, Operation Plan, Fragmentary Order, Warning Order	None	N	2,3,4



**Table 1. Message Default Addressees And Access Levels–Continued**

<b>MESSAGE TYPE</b>	<b>USE</b>	<b>FBCB2 DEFAULT ADDRESSEES</b>	<b>SA</b>	<b>ACCESS LEVEL</b>
Overlay Messages	Group of 19 Overlay Messages	None	N	1,2,3,4
Land Route Report	Report Results of Route, Zone, or Area Reconnaissance	None	N	1,2,3,4
Land Minefield Laying Report	Inform friendly units of location, number/type of mines, dimensions, impact on movement, bypass, and safe corridors	None	N	1,2,3,4
LOGSITREP	Current Logistics Situation	None	N	1,2,3,4
Personnel Status Report	Current Personnel Status	None	N	1,2,3,4
Free Text	Miscellaneous business not covered by a Formatted Message	None	N	1,2,3,4

**END OF WORK PACKAGE**







**OPERATOR MAINTENANCE**  
**COMPUTER SET, DIGITAL AN/UYK-128(V)**  
**NSN NA, EIC NA**

**APPENDIX B: COMBAT FIRE MISSION**

For all indirect fire missions the FBCB2 operator must first send an "Observer Readiness Report" to AFATDS. This report results in the operator's icon being placed on the AFATDS current operations screen. Without the report AFATDS does not process the Fire Mission. Therefore the operator cannot make a digital Call For Fire. This message needs to be added as a precondition or first step for each of the Fire Missions.

**TYPE OF MISSION:** FIRE FOR EFFECT (FFE)

**METHOD OF CONTROL:** FIRE WHEN READY

**Table 1. Fire For Effect/Fire When Ready**

<b>OPERATOR ACTION</b>	<b>CONDITIONS</b>	<b>RESULT</b>
1. FBCB2 operator sends CFF.	a. Combat Message b. Type of Mission: Immediate Suppression/Immediate Smoke. c. Method of Control: Fire when Ready.	a. This results in Fire for Effect (FFE) mission on AFATDS. b. FBCB2 summary tab shows an inactive mission, CFF sent.
2. AFATDS operator sends Message to Observer (MTO) to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and update the summary tab automatically.
3. AFATDS send 3 Observer Mission Updates to FBCB2.	a. Shot. b. Splash. c. Rounds Complete.	FBCB2 receives 3 Observer Mission updates and the summary tab is updated.
4. FBCB2 sends End of Mission (EOM) to AFATDS.		a. FBCB2 summary tab updates. b. At this time the mission can be deleted from the summary tab.

**TYPE OF MISSION:** FIRE FOR EFFECT

**METHOD OF CONTROL:** AT MY COMMAND

**Table 2. Fire For Effect/ At My Command**

<b>OPERATOR ACTION</b>	<b>CONDITIONS</b>	<b>RESULT</b>
1. FBCB2 operator sends CFF.	a. Combat Message b. Type of Mission: Immediate Suppression /Immediate Smoke. c. Method of Control: At My Command.	a. This results in FFE mission on AFATDS.b. FBCB2 summary tab shows an inactive mission, CFF sent.
2. AFATDS operator sends Message to Observer to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and update the summary tab automatically.
3. AFATDS sends 1 Observer Mission Update to FBCB2.	a. Ready.	FBCB2 receives 1 Observer Mission update and the summary tab is updated.
4. FBCB2 sends On Call Fire Command to AFATDS.		FBCB2 summary tab updates.



**Table 2. Fire For Effect/ At My Command–Continued**

<b>OPERATOR ACTION</b>	<b>CONDITIONS</b>	<b>RESULT</b>
5. AFATDS sends 3 Observer Mission Updates to FBCB2.	Shot. Splash Rounds Complete.	FBCB2 summary tab updates.
6. FBCB2 sends End of Mission to AFATDS.		a. FBCB2 summary tab updates. .b. At this time the mission can be deleted from the summary tab.

**TYPE OF MISSION:** ADJUST FIRE, MULTIPLE ADJUSTMENTS**METHOD OF CONTROL:** FIRE WHEN READY**Table 3. Adjust Fire, Multiple Adjustments**

<b>OPERATOR ACTION</b>	<b>CONDITIONS</b>	<b>RESULT</b>
1. FBCB2 operator sends CFF.	a. Type of Mission: Adjust Fire. b. Method of Control: Fire When Ready.	a. This results in an Adjust Fire Mission on AFATDS. b. FBCB2 summary tab shows an inactive mission, CFF sent.
2. AFATDS operator sends Message to Observer to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and updates the summary tab automatically.
3. AFATDS sends 2 Observer Mission Updates to FBCB2.	a. Shot.b. Splash.	FBCB2 receives 2 Observer Mission updates and the summary tab updates.
4. FBCB2 sends LONG Form Subsequent Adjustment to AFATDS.	a. Shift: (as required). b. Transfer to long form c. Leave First Method of Control: Fire When Ready. d. Change Second Method of Control to "None Specified" ( <u>VERY IMPORTANT</u> ). e. Change Method of Fire to Adjust Fire ( <u>VERY IMPORTANT</u> ). f. Send.	a. AFATDS receives the Adjustment and process. b. FBCB2 summary tab updates automatically.
5. AFATDS sends 2 Observer Mission Updates to FBCB2.	a. Shot. b. Splash.	FBCB2 receives 2 Observer Mission updates and the summary tab is update\ds.
6. If more adjustments are necessary before the FFE, repeat step 4 and 5.		
7. To go to the FFE phase, send a Combat Subsequent Adjustment Message to AFATDS.	a. Enter Adjustments. b. Method of Control: Fire When Ready.	a. AFATDS receives Adjustment with FFE.b. FBCB2 summary tab updates automatically.



**Table 3. Adjust Fire, Multiple Adjustments–Continued**

OPERATOR ACTION	CONDITIONS	RESULT
8. AFATDS sends 3 Observer Mission Updates to FBCB2.	a. Shot. b. Splash. c. Rounds Complete.	FBCB2 summary tab updates automatically.
9. FBCB2 sends EOM to AFATDS.		a. FBCB2 summary tab updates. At this time the mission can be deleted from the summary tab.

**TYPE OF MISSION:** ADJUST FIRE, SINGLE ADJUSTMENT**METHOD OF CONTROL:** FIRE WHEN READY**Table 4. Adjust Fire, Single Adjustment**

OPERATOR ACTION	CONDITIONS	RESULT
1. FBCB2 operator sends CFF.	a. Type of Mission: Adjust fire. b. Method of Control: Fire when Ready.	a. This results in an Adjust Fire Mission on AFATDS. b. FBCB2 summary tab shows an inactive mission, CFF sent.
2. AFATDS operator sends Message to Observer to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and updates the summary tab automatically.
3. AFATDS sends 2 Observer Mission Updates to FBCB2.	a. Shot. b. Splash.	FBCB2 receives 2 Observer Mission updates and the summary tab is updated.
4. FBCB2 sends <b>Combat Form</b> Subsequent Adjustment to AFATDS.	a. Shift: (as required). b. Method of Control: Fire When Ready.	a. AFATDS receives the Adjustment and FFE and process. b. FBCB2 summary tab updates automatically.
5. AFATDS sends 3 Observer Mission Updates to FBCB2.	a. Shot. b. Splash. c. Rounds Complete.	FBCB2 receives 3 Observer Mission updates and the summary tab is updated.
6. FBCB2 sends EOM to AFATDS.		a. FBCB2 summary tab updates. b. At this time the mission can be deleted from the summary tab.

**CHECK FIRE/CANCEL CHECK FIRE****TYPE OF MISSION:** N/A**METHOD OF CONTROL:** N/A**Table 5. Check Fire/Cancel Check Fire**

OPERATOR ACTION	CONDITIONS	RESULT
1. FBCB2 operator sends CFF.		FBCB2 summary tab updates.
2. AFATDS operator sends Message to Observer to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and updates the summary tab automatically.
3. FBCB2 sends Check Fire on Active Target.		a. FBCB2 summary tab updates automatically. b. AFATDS receives. c. AFATDS checks fires



**Table 5. Check Fire/Cancel Check Fire--Continued**

<b>OPERATOR ACTION</b>	<b>CONDITIONS</b>	<b>RESULT</b>
4. FBCB2 sends Cancel Check Fire. *		a. FBCB2 summary tab updates automatically. b. AFATDS receives.
5. Mission Continues.		

\*Note: Observer may not Cancel Check Fire.

# **CHECK FIRE ALL/CANCEL CHECK FIRE ALL MISSION**

**TYPE OF MISSION:** N/A

**METHOD OF CONTROL:** N/A

**Table 6. Check Fire All/Cancel Check Fire All Mission**

<b>OPERATOR ACTION</b>	<b>CONDITIONS</b>	<b>RESULT</b>
1. FBCB2 operator sends CFF.		FBCB2 summary tab updates.
2. AFATDS operator sends Message to Observer to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and updates the summary tab automatically.
3. FBCB2 operator sends CFF.		FBCB2 summary tab updates.
4. AFATDS operator sends Message to Observer to FBCB2.	Mission Approved.	FBCB2 receives MTO with target number and updates the summary tab automatically.
5. FBCB2 sends Check Fire All on Active Target.		a. FBCB2 summary tab updates automatically. b. AFATDS receives.
6. FBCB2 sends Cancel Check Fire All from the Long Form Message.		a. FBCB2 summary tab updates automatically. b. AFATDS receives.
7. Mission Continues.		

Note. Check Fire All can be sent by any FBCB2 Operator.

# **END OF WORK PACKAGE**



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**OPERATOR MAINTENANCE**  
**COMPUTER SET, DIGITAL AN/UYK-128(V)**  
**NSN D33865, EIC NA**  
**APPENDIX C: FBCB2 - CSSCS MESSAGE INTERFACE:**

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The FBCB2 - CSSCS message interface consists of seven JVMF Logistics related message threads, plus the JVMF Free Text message.

**CTIL/BRIL Action Message - K07.06.**

1. Identifies CTIL items for logistics reporting
2. Sent down chain of command to individual platforms
3. Sender selects CTIL items to be tracked.
4. Displays new CTIL items database when opened by receiver.
5. Replaces old CTIL database when acknowledged by receiver.

**Logistics Report Message - K07.03.**

1. Reports on-hand and authorized CTIL items by quantity.
2. Sent up chain of command using platform URN up to CO and unit URN for CSSCS.
3. Sender can change on-hand and authorized CTIL item quantities as needed.
4. CTIL item quantities can be combined for retransmission when received by rollup unit.

**Supply Point Status Report Message - K07.09.**

1. Sent to and from forward support BN CSSCS to forward support CO to establish and maintain supply points.
2. Identifies up to 16 distinct supply points by: ID, location, type, and open and close date time group.
3. Displays icon on FBCB2 for each supply point by supply point type.
4. Status of stocked items periodically reported to CSSCS by supply point maintainer

**Personal Status Message - K07.04.**

1. Identifies unit personnel changes.
2. Sent up chain of command beginning at wing or platoon level.
3. Items tracked are: name, SSN, status, unit, role/ID, grade, MOS, gender, nationality, religion, and effective DTG.
4. When message sent, all personnel records in database are included.

**Task Management Message - K07.12.**

1. Consists of following four component threads: Call For Support (CFS), Logistics Task Order (LTO), Task Status, and Task Synchronization.
2. Uses Standard Long Form Message format.
3. All messages related to a specific task are maintained in Task Log.

**Call For Support (CFS).**

1. Sent from FBCB2 requesting support.
2. Identifies: type of support needed, action required, platform needing support, location, and point-of-contact.
3. Message sent directly to CSSCS or forwarded up chain of command.
4. Message can be edited when received and forwarded for further review before final disposition.

**Logistics Task Order (LTO).**

1. Sent from CSSCS to platform that will provide support.
2. Restates original CFS message information.
3. Tasks platform to provide support and schedules work start and end times.

**Task Status.**

1. Sent from platform providing support to CSSCS, and may be sent to CFS message originator.
2. Acknowledges tasking order to provide support and indicates current task status.

**Task Synchronization.**

1. Sent from platform providing support to CSSCS and CFS message originator.
2. Identifies platform needing support, support requested, and point-of-contact



3. Provides time of arrival and location to complete task

**Medical Evacuation Request Message - K07.01.**

1. Sent from FBCB2 to CSSCS.
2. Identifies: location, ambulatory/litter patient numbers, medical priority, pickup markings/color, NBC conditions, and area security.

**Medical Unit Situation Report Message - K07.07.**

1. Sent from FBCB2 to CSSCS.
2. Identifies: present/proposed locations, casualty type/numbers, MEDEVAC mission priority/numbers, ambulance type, blood units type/numbers, critical MOS numbers, and critical supply items numbers.

**Free Text Message - K01.01.**

1. Sent from FBCB2 to CSSCS, and from CSSCS to FBCB2
2. Used to send messages up to 1200 characters long for any purpose

**END OF WORK PACKAGE**



**OPERATOR MAINTENANCE**  
**COMPUTER SET, DIGITAL AN/UYK-128(V)**  
**NSN NA, EIC NA**

**APPENDIX D: ACRONYMS AND ABBREVIATIONS**

**Table 1. Acronyms And Abbreviations**

<b>ACRONYM</b>	<b>DESCRIPTION</b>
31U	SIGNAL SUPPORT SYSTEMS SPECIALIST
35J	TELECOMMUNICATIONS TERMINAL DEVICE REPAIRER
74B	INFORMATION SYSTEM OPERATOR
A2C2	ARMY AIRSPACE COMMAND AND CONTROL
AA	ASSEMBLY AREA
AAR	AFTER ACTION REVIEW
ABCS	ARMY BATTLE COMMAND SYSTEM
ABN	AIRBORNE
AC	ALTERNATING CURRENT
ACD	AUDIO CONTROLLER DEVICE
ACK	ACKNOWLEDGE MESSAGE
ACR	ARMORED CALVARY REGIMENT
ACUS	AREA COMMON USER SYSTEM
AD	ARMORED DIVISION
ACE	ARMORED COMBAT EARTHMOVER
AD	ANCILLARY DEVICE
ADA	AIR DEFENSE ARTILLERY
ADDS	ARMY DATA DISTRIBUTION SYSTEM
AFATDS	ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM
AGCCS	ARMY GLOBAL COMMAND AND CONTROL SYSTEM
AI	AUDIO INTERCOM
AMD	U.S. ARMY AIR AND MISSILE DEFENSE
AMMO	AMMUNITION
ANCD	AUTOMATED NET CONTROL DEVICE
AOR	AREA OF RESPONSIBILITY
APC	ARMORED PERSONNEL CARRIER
APPS	APPLICATIONS
AR	ARMOR
AR	ARMY REGULATION



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
AS	AUTONOMOUS SYSTEM
ASAS	ALL SOURCE ANALYSIS SYSTEM
ASIP	ADVANCED SYSTEM IMPROVEMENT PROGRAM (SINCGARS)
AT	ANTITANK
ATA	ADVANCED TECHNOLOGY ATTACHMENT
AUDIO	AUDIBLE SOUND
AVENGER	AIR DEFENSE WEAPONS SYSTEM – WHEELED
AVN	AVIATION
ATCCS	ARMY TACTICAL COMMAND AND CONTROL SYSTEM
AWE	ADVANCED WARFIGHTING EXPERIMENT
AWIS	ARMY WORLDWIDE MILITARY COMMAND AND CONTROL SYSTEM
B2C2	BRIGADE AND BELOW COMMAND AND CONTROL
BADDS	BATTLEFIELD AWARENESS DATA DISSEMINATION SYSTEM
BAS	BATTLEFIELD AUTOMATION SYSTEM
BCIS	BATTLEFIELD COMBAT IDENTIFICATION SYSTEM INFORMATION SYSTEM
BCO	BATTLE COMMAND OPERATIONS
BCT	BRIGADE COMBAT TEAM
BCV	BATTLE COMMAND VEHICLE
BDA	BATTLE DAMAGE ASSESSMENT
BDE	BRIGADE
BFA	BATTLEFIELD FUNCTIONAL AREA
BFACS	BATTLEFIELD FUNCTIONAL AREA CONTROL SYSTEM
BFIST	BRADLEY FIRE SUPPORT VEHICLE
BIOS	BASIC INPUT/OUTPUT SYSTEM
B-KIT	FBCB2 HARDWARE, I.E., COMPUTER UNIT, DISPLAY UNIT, KEYBOARD UNIT, CABLING
BMP	BOYEVAYA MASHINA PEHOTI
BN	BATTALION
BOS	BATTLEFIELD OPERATING SYSTEM
BP	BATTLE POSITION
BRG	BEARING
BRIL	BASLINE REQUIREMENTS ITEMS LIST
BSFV-E	BRADLEY STINGER FIGHTING VEHICLE-ENHANCED
BSM	BATTLEFIELD SPECTRUM MANAGEMENT
C2	COMMAND AND CONTROL



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
C2V	COMMAND AND CONTROL VEHICLE
C3	COMMAND, CONTROL, AND COMMUNICATIONS
C4I	COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS AND INTELLIGENCE
CADRG	COMPRESSED ARC DIGITAL RASTER GRAPHICS
CARC	CHEMICAL AGENT RESISTANT COATING
CC	CARBON COPY
CCA	CIRCUIT CARD ASSEMBLY
CCP	CASUALTY COLLECTION POINT
CCIR	COMMANDER'S CRITICAL INFORMATION REQUIREMENTS
CD	CAVALRY DIVISION
CD	COMPACT DISK
CDR	COMMANDER
CDRL	CONTRACT DATA REQUIREMENTS LIST
CFF	CALL FOR FIRE
CFS	CALL FOR SUPPORT
CGM	COMPUTER GRAPHIC METAFILE
CHAN	CHANNEL
CID	COMBAT IDENTIFIER
CINC	COMMANDER IN CHIEF
CITV	COMMANDERS INDEPENDENT THERMAL VIEWER
CMD	COMMAND
CMOS	COMPLIMENTARY METAL OXIDE SEMICONDUCTOR
CNR	COMBAT NET RADIO
CO	COMPANY
COA	COURSE OF ACTION
COE	COMMON OPERATING ENVIRONMENT
COMM	COMMUNICATIONS
COMSEC	COMMUNICATIONS SECURITY
CONOPS	CONCEPT OF OPERATIONS
CONT	CONTINUED
COTS	COMMERCIAL OFF-THE-SHELF
CP	COMMAND POST
CPR	CARDIOPULMONARY RESUSCIATATION
CPU	COMPUTER PROCESSING UNIT



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
CS	COMBAT SUPPORT
CSMA	CARRIER SENSE MULTIPLE-ACCESS
CSS	COMBAT SERVICE SUPPORT
CSSCS	COMBAT SERVICE SUPPORT CONTROL SYSTEM
CST	CENTRAL STANDARD TIME
CT	CIPHER TEXT
CTIL	COMMANDER'S TRACKED ITEMS LIST
CTT	COMPANY TRAINING TEAM
CU	COMPUTER UNIT
CUCV	COMMERCIAL UTILITY CARGO VEHICLE
DC	DIRECT CURRENT
DC2	DIGITAL COMMAND AND CONTROL
DCE	DISTRIBUTED COMPUTING EQUIPMENT
DdhmmZmm- myyyy	MILITARY DATE TIME GROUP: DAY-HOUR-MINUTE-ZULU TIME-MONTH-YEAR, i.e., 210630ZMAY1999
DID	DATA ITEM DESCRIPTION
DII	DEFENSE INFORMATION INFRASTRUCTURE
DESC	DESCRIPTION
DIV	DIVISION
DMS	DEGREES, MINUTES, SECONDS
DOD	DEPARTMENT OF DEFENSE
DOG	DIGITAL OPERATORS GUIDE
DRAM	DYNAMIC RANDOM ACCESS MEMORY
DS	DIRECT SUPPORT
DSMM	DIRECT SUPPORT MAINTENANCE MANUAL
DSOP	DIGITAL STANDARD OPERATING PROCEDURES
DTED	DIGITAL TERRAIN ELEVATION DATA
DTD/MDL	DATA TRANSFER DEVICE/MISSION DATA LOADER
DTG	DATE TIME GROUP
DU	DISPLAY UNIT
EAC	ECHELONS ABOVE CORPS
EBC	EMBEDDED BATTLE COMMAND
ECB	ECHELONS CORPS AND BELOW
EOC	END OF COURSE



Table 1. Acronyms And Abbreviations--Continued

ACRONYM	DESCRIPTION
EOM	END OF MISSION
EOM	EQUIPMENT OPERATORS MANUAL
EPLRS	ENHANCED POSITION LOCATION REPORTING SYSTEM
EPM	EXTERNAL POWER MODULE
EPUU	EPLRS USER UNIT
ERF	ELECTRONIC REMOTE FILL
ESD	ELECTROSTATIC DISCHARGE
ESDS	ELECTROSTATIC DISCHARGE SENSITIVE
ETA	ESTIMATED TIME OF ARRIVAL
EVG	ENEMY VICINITY GRID
EW	ELECTRONIC WARFARE
EXT	EXTERNAL
FA	FIELD ARTILLERY
FAAD	FORWARD AREA AIR DEFENSE
FAADC2I	FORWARD AREA AIR DEFENSE COMMAND, CONTROL AND INTELLIGENCE SYSTEM
FAADC3I	FORWARD AREA AIR DEFENSE COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE SYSTEM
FAASV	FIELD ARTILLERY AMMUNITION SUPPLY VEHICLE
FBCB2	FORCE XXI BATTLE COMMAND BRIGADE AND BELOW
FCN	FUNCTION
FCTN	FUNCTION
FDC	FIRE DIRECTION CENTER
FEBA	FORWARD EDGE OF BATTLE AREA
FFE	FIRE FOR EFFECT
FH	FREQUENCY HOPPING
FHMUX	FREQUENCY HOPPING MULTIPLEXER
FIPR	FLASH, IMMEDIATE, PRIORITY, ROUTINE
FLOT	FORWARD LINE OF OWN TROOPS
FM	FIELD MANUAL
FM	FREQUENCY MODULATION
FOM	FIGURE OF MERIT
FOS	FORWARD OBSERVER SYSTEM
FPF	FINAL PROTECTIVE FIRES
FRAGO	FRAGMENTARY ORDER



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
FS	FIRE SUPPORT
FSB	FORWARD SUPPORT BATTALION
FSD	FLANK SECURITY DETACHMENT
FSE	FIRE SUPPORT ELEMENT
GB	GIGABYTE
GCI	GRAPHICAL COMMANDER'S INTENT
GEOREF	GEOGRAPHICAL REFERENCE
GFE	GOVERNMENT FURNISHED EQUIPMENT
GHZX	GIGAHERTZ (1 BILION HERTZ)
GMTX	GREENWICH MEAN TIME
GND	GROUND
GPS	GLOBAL POSITIONING SYSTEM
GPU	GENERAL PURPOSE USER
GS	GENERAL SUPPORT
GUI	GRAPHICAL USER INTERFACE
GTA	GRAPHICAL TRAINING AID
HEAT	HIGH EXPLOSIVE ANTI-TANK
HEMTT	HEAVY EXPANDED MOBILITY TACTICAL TRUCK
HDD	HARD DISK DRIVE
HDDC	HARD DISK DRIVE CARTRIDGE
HF	HIGH FREQUENCY
HMMWV	HIGH MOBILITY MULTI-PURPOSE WHEELED VEHICLE (HUMMER)
HQ	HEADQUARTERS
HTML	HYPER TEXT MARKUP LANGUAGE
HUB	HOLD UP BATTERY
HUD	HEADS UP DISPLAY
HXWXD	HEIGHT BY WIDTH BY DEPTH
IAW	IN ACCORDANCE WITH
ICOM	INTEGRATED COMMUNICATIONS SECURITY
ID	INFANTRY DIVISION
IDE	INTEGRATED DRIVE ELECTRONICS
IETM	INTERACTIVE ELECTRONIC TECHNICAL MANUAL
IHFR	IMPROVED HIGH FREQUENCY RADIO



Table 1. Acronyms And Abbreviations--Continued

ACRONYM	DESCRIPTION
I-KIT	INSTALLATION KIT CONTAINING THE GPS MOUNT, POS/NAV MOUNT, CONVERTER MOUNT AND CABLES.
IKP	INSTRUCTOR AND KEY PERSONNEL
IMETS	INTEGRATED METEOROLOGICAL SYSTEM
INC	INTERNET CONTROLLER
INFOSYS	INFORMATION SYSTEM
IOT	IN ORDER TO
IP	INTERNET PROTOCOL
ISYSCON	INTEGRATED SYSTEM CONTROL
INTERCOM	INTER-COMMUNICATION DEVICE
I/O	INPUT/OUTPUT
JOG	JOINT OPERATIONAL GRAPHICS
JSTARS	JOINT SURVEILLANCE TARGET ATTACK RADAR SYSTEM
JTF	JOINT TASK FORCE
JTIDS	JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM
JVMF	JOINT VARIABLE MESSAGE FORMAT
KB	KILOBYTE (1,000 BYTES)
KB/S	KILOBYTES PER SECOND
KBD	KEYBOARD
KEK	KEY ENCRYPTION KEY
KHZ	KILOHERTZ (THOUSAND CYCLES PER SECOND)
KIA	KILLED IN ACTION
LAN	LOCAL AREA NETWORK
LAT/LONG	LATITUDE/LONGITUDE
LBS	POUNDS
LC	LINE OF CONTACT
LCD	LIQUID CRYSTAL DISPLAY
LCN	LOGICAL CHANNEL NUMBER
LCU	LIGHTWEIGHT COMPUTER UNIT
LD	LINE OF DEPARTURE
LDE	LOCAL DATA ENTRY
LED	LIGHT EMITTING DIODE
LOA	LIMIT OF ADVANCE
LOC	LOCATION



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
LOGSITREP	LOGISTICS STATUS REPORT
LOS	LINE OF SIGHT
LO/M/HI	LOW/MEDIUM/HIGH
LRBSD	LONG RANGE BIOLOGICAL STANDOFF DETECTION SYSTEM
LRF	LASER RANGE FINDER
LRU	LINE REPLACEABLE UNIT
LTO	LOGISTICAL TASK ORDER
LUT	LIMITED USER TEST
MA	MACHINE ACKNOWLEDGE
MAC	MAINTENANCE ALLOCATION CHART
MB	MEGABYTE
MBA	MAIN BATTLE AREA
MB/S	MEGABYTES PER SECOND
MCS	MANEUVER CONTROL SYSTEM
MCS/P	MANEUVER CONTROL SYSTEM/PHOENIX
MDT	MOUNTAIN DAYLIGHT TIME
MDMP	MILITARY DECISION MAKING PROCESS
MEDEVAC	MEDICAL EVACUATION
MEF	MARINE EXPEDITIONARY FORCE
MGRS	MILITARY GRID REFERENCE SYSTEM
MHZ	MEGAHERTZ
MIA	MISSING IN ACTION
MIB	MANAGEMENT INFORMATION BASE
MICAD	MULTIPURPOSE INTEGRATED CHEMICAL AGENT DETECTOR
MIL-ID	MILITARY IDENTIFICATION
MIL-SPEC	MILITARY SPECIFICATION
MIL-STD	MILITARY STANDARD
MISC	MISCELLANEOUS
MLRS	MULTIPLE LAUNCH ROCKET SYSTEM
MOPP	MISSION-ORIENTED PROTECTIVE POSTURE
MOS	MILITARY OCCUPATIONAL SPECIALITY
MRB	MOTORIZED RIFLE BATTALION
MRC	MOTORIZED RIFLE COMPANY
MRD	MOTORIZED RIFLE DIVISION



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
MRR	MOTORIZED RIFLE REGIMENT
MTC	MOTORIZED TANK COMAPNY
MSD	MINIMUM SAFE DISTANCE
MSE	MOBILE SUBSCRIBER NETWORK
MSE-TPN	MOBILE SUBSCRIBER EQUIPMENT-TACTICAL PACKET NETWORK
MSG	MULTIPLE-SOURCE GROUP
MTO	MESSAGE TO OBSERVER
MTTR	MEAN TIME TO REPAIR
NAV	NAVIGATION
NBC	NUCLEAR, BIOLOGICAL, CHEMICAL
NCA	NATIONAL COMMAND AUTHORITY
NCS	NET CONTROL STATION
NDI	NON-DEVELOPMENTAL ITEM
NET	NEW EQUIPMENT TRAINING
NIMA	NATIONAL IMAGERY MAPPING AGENCY
NiMH	NICKEL-METAL-HYDRIDE
NITFS	NATIONAL IMAGERY TRANSMISSION FORMAT STANDARDS
NLT	NOT LATER THAN
NMT	NETWORK MANAGEMENT TOOL
NS	NOT SPECIFIED
NTDR	NEAR TERM DIGITAL RADIO
OA	OPERATOR ACKNOWLEDGE
O/H	ON HAND
ONC	OPERATIONAL NAVIGATION CHARTS
O/O	ON ORDER
OOTW	OPERATIONS OTHER THAN WAR
OPFAC	OPERATIONAL FACILITIES
OPLAN	OPERATIONS PLAN
OPORD	OPERATIONS ORDER
OPS	OPERATIONS
OR	OPERATOR RESPONSE
OS	OPERATING SYSTEM
OSPF	OPEN SHORTEST PATH FIRST
PC	PERSONAL COMPUTER



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
PCC	PRE COMBAT CHECKS
PCI	PRE COMBAT INSPECTIONS
PCKT	PACKET DATA MODE
PDF	PRINCIPLE DIRECTION OF FIRE
PE	PRACTICAL EXERCISE
PERSITREP	PERSONNEL SITUATION REPORT
PGI	THE PHOENIX GROUP, INC.
PL	PHASE LINE
PLGR	PRECISION LIGHTWEIGHT GLOBAL POSITIONING SYSTEM RECEIVER
PLT LDR	PLATOON LEADER
PCMCIA	PERSONAL COMPUTER MEMORY CARD INTERNATIONAL ASSOCIATION
PMCS	PREVENTIVE MAINTENANCE CHECKS AND SERVICES
PM-TRCS	PROGRAM MANAGER - TACTICAL RADIO COMMUNICATION SYSTEM
PND	POSITION NAVIGATION DEVICE
POC	POINT OF CONTACT
POI	PROGRAM OF INSTRUCTION
POL	PETROLEUM, OIL, AND LUBRICANTS
POS/NAV	POSITION AND NAVIGATION
POST	POWER-ON-SELF-TEST
POW	PRISONER OF WAR
PPP	POINT TO POINT PROTOCOL
PSG	PLATOON SERGEANT
PR	POSITION REPORT
PT	PLAIN TEXT
PWR	POWER
QRG	QUICK REFERENCE GUIDE
QWERTY	ALPHA NUMERIC AMERICAN STANDARD KEYBOARD
RAM	RANDOM ACCESS MEMORY
RC	REMOTE CAPABILITY
RCU	REMOTE CONTROL UNIT
REDCON	READINESS CONDITION
RF	RADIO FREQUENCY
ROM	READ ONLY MEMORY
RPC	REMOTE PROCEDURE CALL



Table 1. Acronyms And Abbreviations–Continued

ACRONYM	DESCRIPTION
RS	RADIO SET
RT	RECEIVER TRANSMITTER
R/T	RECEIVER/TRANSMITTER
RSTA	RECONNAISSANCE, SURVEILLANCE, AND TARGET ACQUISITION
SA	SITUATION AWARENESS
SALT	SIZE, ACTIVITY, LOCATION, TIME
SALUTE	SIZE, ACTIVITY, LOCATION, UNIT, TIME AND EQUIPMENT
SC	SINGLE CHANNEL
SCS	STUDENT CRITIQUE SHEET
SCSI	SMALL COMPUTER SYSTEMS INTERFACE
SINGARS	SINGLE CHANNEL GROUND AIRBORNE RADIO SYSTEM
SIP	SYSTEM IMPROVEMENT PROGRAM (SINGARS)
SITREP	SITUATION REPORT
SME	SUBJECT MATTER EXPERT
SMI	SOLDIER MACHINE INTERFACE
SMS	SESSION MANAGER SCREEN
SO	SECURITY OFFICER
SOI	SIGNAL OPERATING INSTRUCTIONS
SOP	STANDARD OPERATING PROCEDURES
SOS	SYSTEM OF SYSTEMS
SOVG	SEIZE OBJECTIVE VICINITY GRID
SRU	SHOP REPLACEABLE UNIT
SSN	SOCIAL SECURITY NUMBER
STACCS	STANDARD THEATER ARMY COMMAND AND CONTROL SYSTEM
STAMIS	STANDARD ARMY MANAGEMENT INFORMATION SYSTEM
STBY	STANDBY
SUM	SOFTWARE USERS MANUAL
SVGA	SUPER VIDEO GRAPHICS ARRAY
SW	SOFTWARE
SYS ADMIN	SYSTEM ADMINISTRATION
TAC	TACTICAL COMMAND POST
TBD	TO BE DETERMINED
TACSAT	TACTICAL SATELLITE
TBS	TO BE SUPPLIED



Table 1. Acronyms And Abbreviations--Continued

ACRONYM	DESCRIPTION
TCP/IP	TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL
TEK	TRAFFIC ENCRYPTION KEY
TI	TACTICAL INTERNET
TIC/TID	TACTICAL INTERNET CONTROLLER/ TACTICAL INTERNET DESIGNER
TLM	TOPOGRAPHIC LINE MAPS
TM	TECHNICAL MANUAL
TMDE	TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT
TMG	TACTICAL MULTINET GATEWAY
TNB	TURRET NETWORK BOX
TNS	TACTICAL NAME SERVER
TO	TACTICAL ORDER
TOC	TACTICAL OPERATIONS CENTER
TPC	TACTICAL PILOTAGE CHARTS
TPN	TACTICAL PACKET NETWORK
TRI-TAC	TRI-SERVICE PROGRAM FOR DEVELOPMENT OF TACTICAL COMMUNICATIONS
TTP	TACTICS, TECHNIQUES AND PROCEDURES
UAV	UNMANNED AERIAL VEHICLE
UIC	UNIT IDENTIFICATION CODE
UMCP	UNIT MAINTENANCE CONTROL POINT
UMM	UNIT MAINTENANCE MANUAL
UNC	UNIVERSAL NAMING CONVENTION
UOM	UNIT OF MEASURE
URN	UNIT REFERENCE NUMBER
URO	USER READ OUT
USB	UNIVERSAL SERIAL BUS
UTM	UNIVERSAL TRANSVERSE MERCATOR
UTO	UNIT TASK ORGANIZATION
UMM	UNIT MAINTENANCE MANUAL
V2	FBCB2 COMPUTER VERSION 2 (RUGGEDIZED)
VAA	VEHICLE AMPLIFIER ADAPTER
VAC	ALTERNATE CURRENT
VDC	VOLTS DIRECT CURRENT
VGA	VIDEO GRAPHICS ARRAY
VHSIC	VERY HIGH SPEED INTEGRATED CIRCUIT (EPLRS)



**Table 1. Acronyms And Abbreviations–Continued**

<b>ACRONYM</b>	<b>DESCRIPTION</b>
VIS	VEHICLE INTERCOMMUNICATIONS SYSTEMS
VMF	VARIABLE MESSAGE FORMAT
VPF	VECTOR PRODUCT FORMAT
WAN	WIDE AREA NETWORK
WARNORD	WARNING ORDER
WIA	WOUNDED IN ACTION
WILCO	WILL COMPLY
WLAN	WIRELESS LOCAL AREA NETWORK
XMIT	TRANSMIT
XO	EXECUTIVE OFFICER
Y2K	YEAR 2000
ZULU TIME	GREENWICH MEAN TIME


**END OF WORK PACKAGE**







## RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

				<b>SOMETHING WRONG WITH THIS PUBLICATION?</b>	
				<b>FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)</b> Co. B, 1st BN, 2nd Brigade Ft. Hood, TX 76445	
				<b>DATE SENT</b> 16 July 2001	
<b>PUBLICATION NUMBER</b> TM 11-7010-326-10			<b>PUBLICATION DATE</b>		<b>PUBLICATION TITLE</b> Operator's Manual Computer Set, Digital AN/UYK-128(V)
<b>BE EXACT PIN-POINT WHERE IT IS</b>				<b>IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:</b>	
<b>PAGE NO</b>	<b>PARA-GRAPH</b>	<b>FIGURE NO</b>	<b>TABLE NO</b>	<div style="position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%) rotate(-45deg); font-size: 100px; opacity: 0.3;">SAMPLE</div> <p>The RHDDC is discussed in the paragraph but is not shown in the illustration. Need to illustrate the RHDDC.</p> <p>Figure 2-10 shows task bar labeled toward bottom of illustration. Unclear whether task bar is a portion or whole bottom bar.</p> <p>Table 3-1, step 12. Add RHDDC to list of components that needs to be present and inspected to ensure no damage after mission is completed.</p> </div>	
1-3	1-1.2				
2-14		2-10			
3-10			3-1		
<b>PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER</b> John Doe SGT 532-8321				<b>SIGN HERE</b> <i>John Doe</i>	

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 <p>THEN...JOT DOWN THE INFO ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL.</p>		<b>SOMETHING WRONG WITH THIS PUBLICATION?</b>	
		<b>FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)</b>	
<b>PUBLICATION NUMBER</b> TM 11-7010-326-10		<b>PUBLICATION DATE</b> 07 September 2001	<b>PUBLICATION TITLE</b> Operator's Manual Computer Set, Digital AN/UYK-128(V)
<b>BE EXACT PIN-POINT WHERE IT IS</b>		<b>IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:</b>	
<b>PAGE NO</b>	<b>PARA-GRAPH</b>	<b>FIGURE NO</b>	<b>TABLE NO</b>
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		DATE SENT		
PUBLICATION NUMBER TM 11-7010-326-20		PUBLICATION DATE 07 September 2001	PUBLICATION TITLE Installation Kit Technical Bulletin Computer Set, Digital AN/UYK-128(V)	
BE EXACT PIN-POINT WHERE IT IS		IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:		
PAGE NO	PARA- GRAPH			FIGURE NO
PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER		SIGN HERE		

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FBCMI\_4016\_05



**PENDING**

FBCMI\_4018\_01



## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

### SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Inches  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

### WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 lb.  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

### CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

### LIQUID MEASURE

1 Millimeter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Millimeters = 32.82 Fluid Ounces

### TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5 ^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

## APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches .....	Centimeters .....	2.540
Feet .....	Meters .....	0.305
Yards .....	Meters .....	0.914
Miles .....	Kilometers .....	1.609
Square Inches .....	Square Centimeters .....	6.451
Square Feet .....	Square Meters .....	0.093
Square Yards .....	Square Meters .....	0.836
Square Miles .....	Square Kilometers .....	2.590
Acres .....	Square Hectometers .....	0.405
Cubic Feet .....	Cubic Meters .....	0.028
Cubic Yards .....	Cubic Meters .....	0.765
Fluid Ounces .....	Milliliters .....	29.573
Pints .....	Liters .....	0.473
Quarts .....	Liters .....	0.946
Gallons .....	Liters .....	3.785
Ounces .....	Grams .....	28.349
Pounds .....	Kilograms .....	0.454
Short Tons .....	Metric Tons .....	0.907
Pound-Feet .....	Newton-Meters .....	1.356
Pounds per Square Inch .....	Kilopascals .....	6.895
Miles per Gallon .....	Kilometers per Liter .....	0.425
Miles per Hour .....	Kilometers per Hour .....	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters .....	Inches .....	0.394
Meters .....	Feet .....	3.280
Meters .....	Yards .....	1.094
Kilometers .....	Miles .....	0.621
Square Centimeters .....	Square Inches .....	0.155
Square Meters .....	Square Feet .....	10.764
Square Meters .....	Square Yards .....	1.196
Square Kilometers .....	Square Miles .....	0.386
Square Hectometers .....	Acres .....	2.471
Cubic Meters .....	Cubic Feet .....	35.315
Cubic Meters .....	Cubic Yards .....	1.308
Milliliters .....	Fluid Ounces .....	0.034
Liters .....	Pints .....	2.113
Liters .....	Quarts .....	1.057
Liters-Meters .....	Gallons .....	0.264
Grams .....	Ounces .....	0.035
Kilograms .....	Pounds .....	2.205
Metric Tons .....	Short Tons .....	1.102
Newton-Meters .....	Pound-Feet .....	0.738
Kilopascals .....	Pounds per Square Inch .....	0.145
Kilometers per Liter .....	Miles per Gallon .....	2.354
Kilometers per Hour .....	Miles per Hour .....	0.621

